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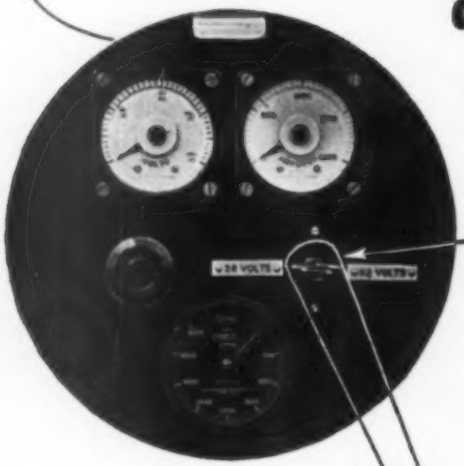

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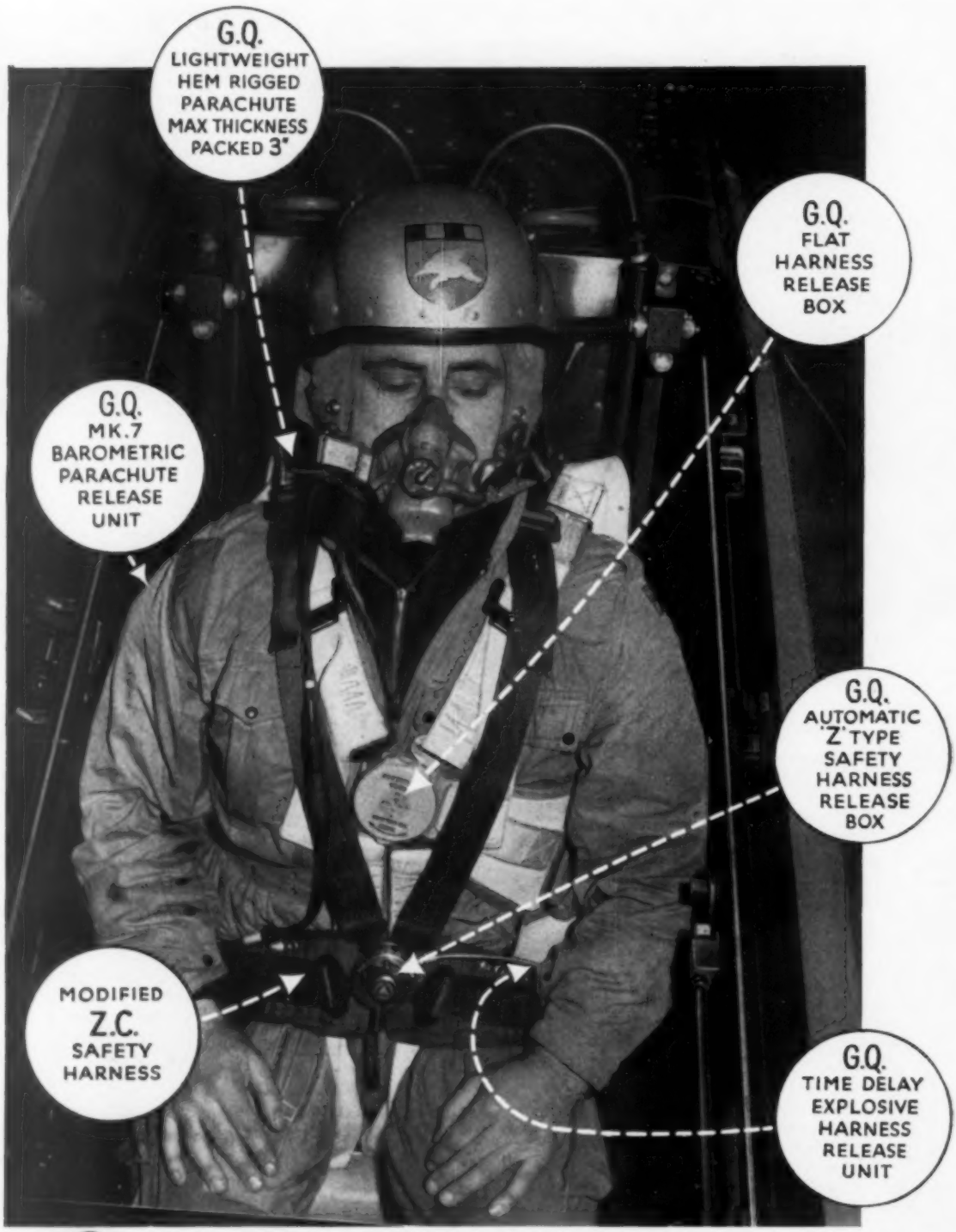

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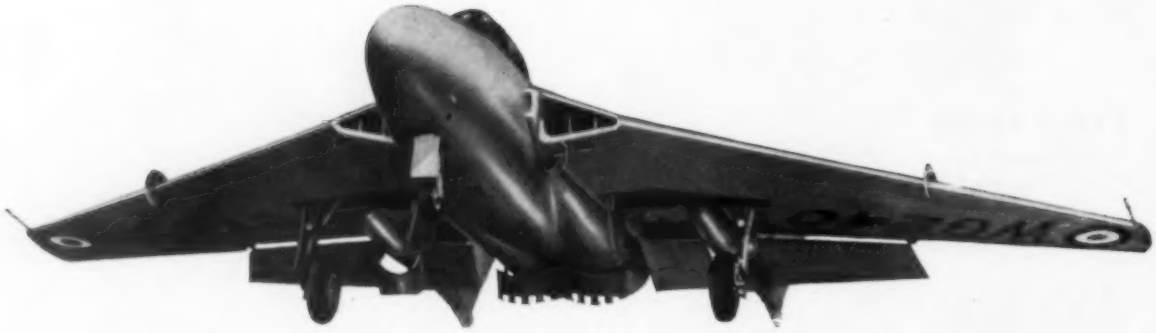

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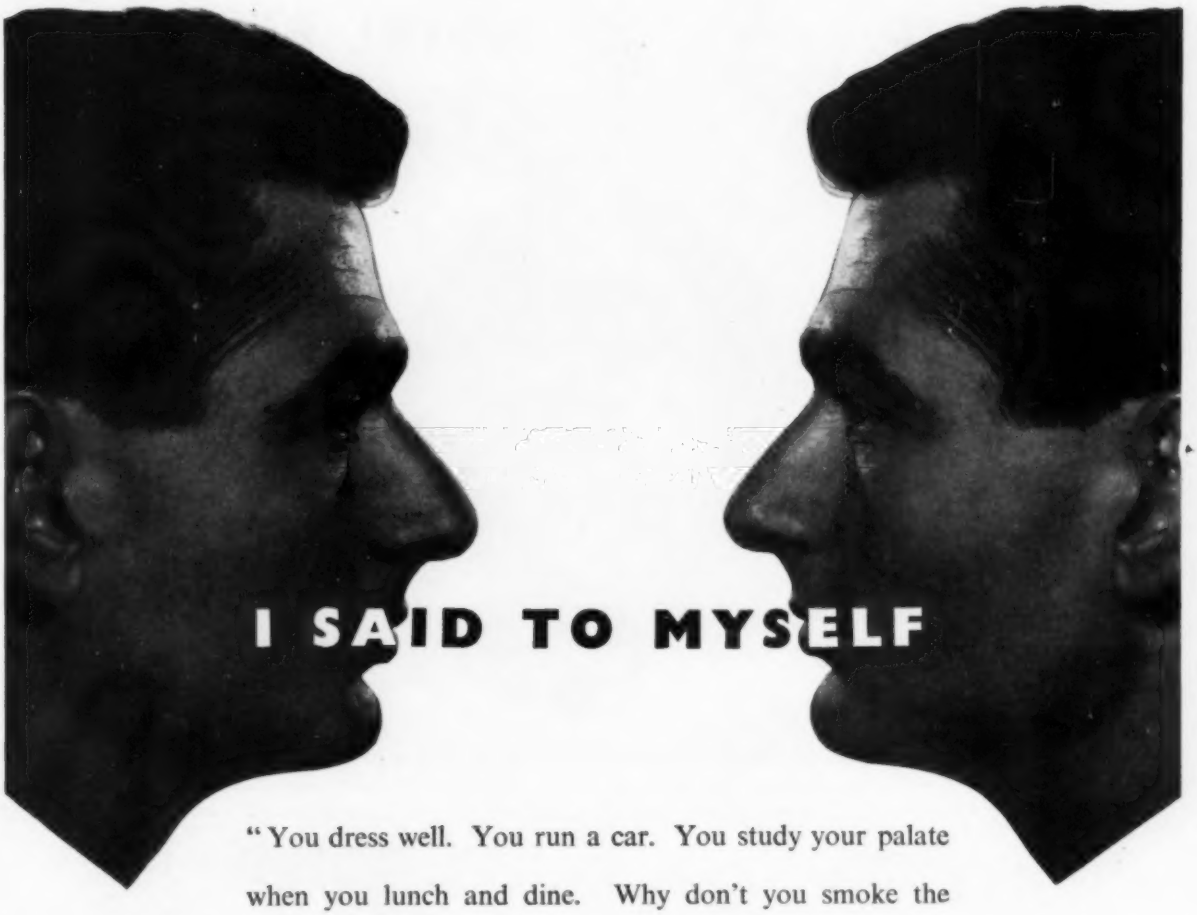

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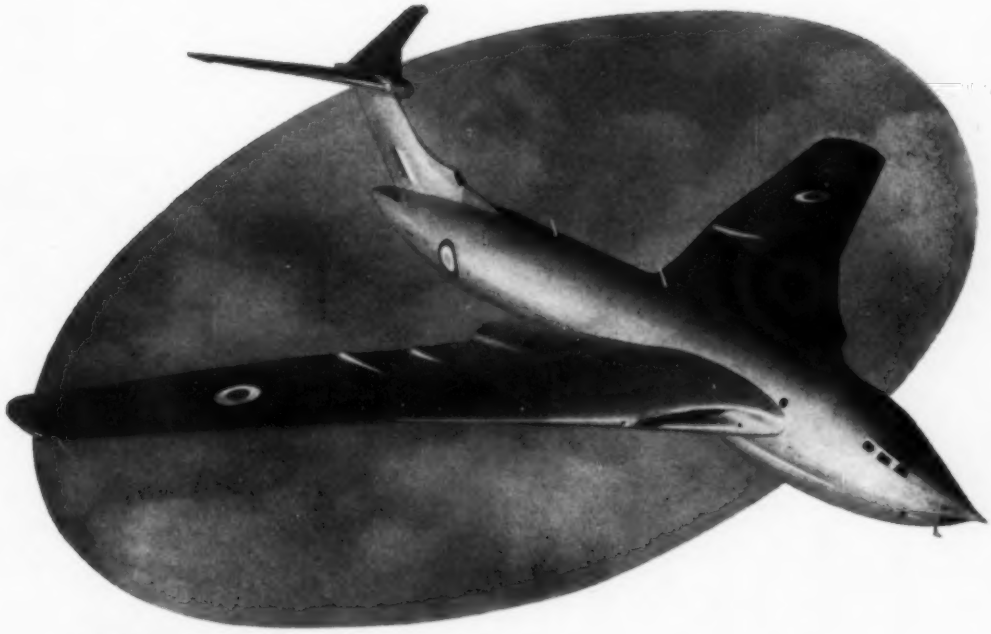

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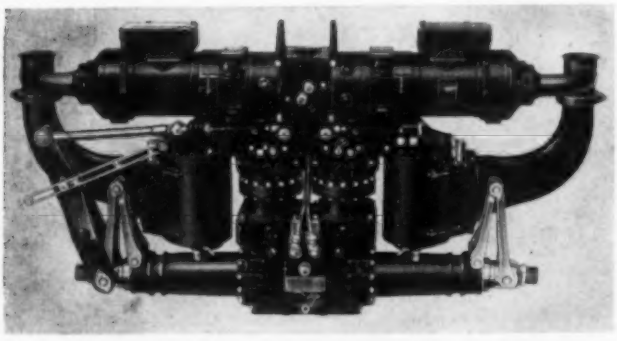

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FLIGHT
and
AIRCRAFT ENGINEER

No 2464 Vol 69 FRIDAY 13 APRIL 1956

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Tussle in India

WHEN we suggested last week that the Tu-104 jet airliner should be recognized as a serious commercial rival and not dismissed as some exotic creation of Soviet propaganda, we had in mind the Russians' clear resolve to sell their civil and military aircraft at every opportunity. Especially, we were aware of their eagerness that, following the precedents of the satellite states and Egypt, India's jet-bomber force should be equipped with Il-28s rather than Canberras. Calling for some dozens of machines, the prospective order, it was thought, might run to some £20 million and was thus a commercial, as well as a political, prize. Circumstances were favourable to Russia in that the Ilyushin bomber was cheaper than the Canberra in first cost, and early delivery could be guaranteed. Spares, according to one report at least, were to be thrown in for good measure. To Britain's advantage was the recognized technical superiority of the Canberra in terms of performance and versatility, and a long and amicable prelude of consultation and negotiation. A brief acquaintanceship by Indian Air Force personnel with France's smaller, faster Vautour appears to have been no more than a light flirtation.

India's choice demanded the shrewdest judgment, for it was recognized that Pakistan's continuing membership of the British Commonwealth could mean, in time of conflict, the total severance of aircraft supplies from the United Kingdom. The personal approach of Marshal Bulganin and Mr. Kruschev added weight to the deliberations.

Though as we write the Canberra contract still awaits signature (the Indian Government, indeed, has yet to make a formal declaration of its choice), there is near-certainty that the British machine has won the day, and that Indian squadrons will thus receive the finest equipment now available in the twin-jet multi-purpose class. And though congratulations would as yet be premature, we may convey felicitations on a job well done.

Meanwhile, we may hope that the pending contract—believed to call for the multi-rôle Mk 8 Canberra and possibly for T.4 trainers also—will not embarrass the production programme of English Electric's P.1 supersonic intercepter, a type (it may be added in the present context) which in its own good time may emulate the export record of the Canberra.

The Clubs and Industry

A HEALTHY exception to the disappointingly slow general rate of progress of the Firms' Flying Club scheme is the lively first-year activity reported by the Vickers-Armstrongs Weybridge Club on page 434 of this issue. In only 12 months some 2,000 hours have been flown and 50 Private Pilots' Licences have been earned; and a still higher rate of flying is planned for the coming year. It is hardly surprising that the Vickers scheme has gained such great support from members (and would-be members—the original idea aroused the interest of over 600 employees), for the ninety-per-cent contribution of the company towards the cost of flying has certainly removed all financial objections to learning to fly—even for apprentices.

More important than a particularly high rate of subsidy, however, is that firms should support a high rate of flying—should guarantee a number of hours large enough to make possible worthwhile results.

The advantages of company club flying are several, the obvious one being the benefit an individual member receives in flying at reduced rates. Often overlooked, however, are the important advantages to the parent flying club of increased utilization of aircraft; and the real, if immeasurable, gain to the company in employing keen flying enthusiasts with an added interest in their job.

The light flying movement as a whole also stands to gain new life from the works clubs. The Surrey club of Vickers has shown itself well representative of the best. The example is there for other companies—and employees—to follow. The present total of some 30 such clubs is not enough.

FROM ALL QUARTERS

The Duke at Brough

ON Thursday of last week, as reported on page 409, the Duke of Edinburgh visited Ferryfield and flew a Bristol Superfreighter across the Channel, and on the following day he handled an even bigger transport aircraft—the Blackburn Beverley. He was visiting the Blackburn and General Aircraft factory at Brough. After reopening the Trinity House Navigation School at Hull, the Duke went on to the works, where he was received by Mr. Eric Turner (chairman) and Marshal of the Royal Air Force Sir John Slessor (director). When other members of the Board had been introduced to him, and after he had inspected a collection of model aircraft spanning the years from 1909 to 1956, the Duke went out to the airfield. Here were the Blackburn 1912 monoplane, a 1930 B.2 trainer and, by contrast, a Beverley. The transport contained typical equipment for its various duties, including roller conveyors, stretchers and trooping fittings.

Three Beverleys from R.A.F. Station Abingdon then flew across the airfield in line astern at 500ft, followed by a fourth, flown by Blackburn test pilot "Sailor" Parker, who demonstrated the dropping of a 14,000-lb load, suspended from four 66ft parachutes, exactly on a target in the centre of the airfield.

The royal visitor now entered a Beverley piloted by chief test pilot Tim Wood. In the air the Duke changed places in the right-hand seat with test pilot Dick Chandler in order to get the feel of the aircraft; then, after studying a demonstration landing by Tim Wood, he changed over to the first pilot's seat and accomplished his own take-off and landing with no trouble at all—in the words of Tim Wood, "a natural pilot."

A minor incident provided a "story" for reporters when a fire-extinguisher was accidentally discharged during the flight and Tim Wood turned on oxygen as a precaution.

After lunch with the directors, the Duke spent a considerable time in the design office studying drawings of a new aircraft, a contract for which was placed with the company last year. He also saw a model of the firm's new supersonic wind tunnel. The Duke went on to tour the Beverley assembly line and the engine division, spending a long time at the test-beds, where a Twin Turmo was under test.

After a visit to Hull University Air Squadron the Duke returned to London in his Heron.

Lockheed Nuclear Project

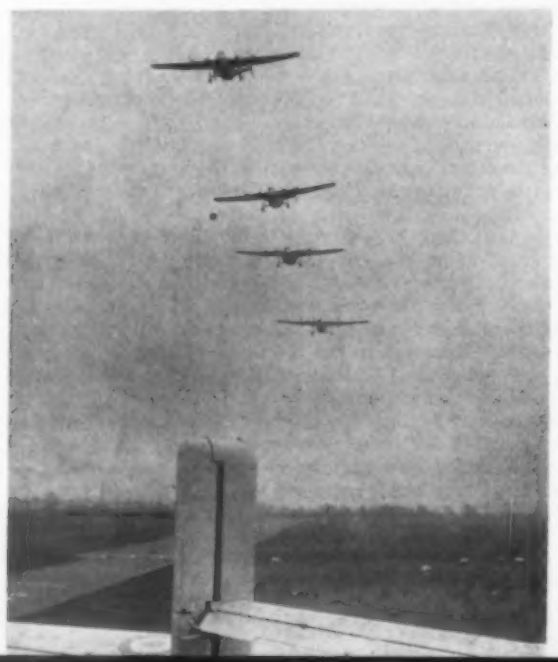
CONTRACTS were placed by the U.S. Air Force on April 9th with Lockheed and Convair for the "further development of nuclear-powered airplanes". It was stated that Lockheed would build the largest research and development facilities in the United States for atomic-powered aircraft. These facilities were reported by the *Atlanta Constitution* to be situated on 10,000 acres of land near Dawsonville, Georgia, some 40 miles north-east of the Lockheed-occupied factory at Marietta. The newspaper said that the project (presumably Lockheed's share) would cost between £18m and £36m.

The Convair Division of the General Dynamics Corporation were one of the first American companies to enter the atomic-aircraft field and they have already flown a B-36 carrying a power reactor believed to be of G.E. manufacture. The new contract is specifically for the development of an airframe for a Convair nuclear-powered aircraft and the company are to use extensions to their existing facilities at Fort Worth, Texas.

Other companies working in this field are known to include General Electric, Pratt and Whitney Aircraft and Boeing, but these companies are not mentioned in the statement from Washington.

TRANSPORT PILOT: The Duke of Edinburgh at the controls of the Blackburn and General Aircraft Beverley (see first news item). After a demonstration by Tim Wood the Duke himself landed the aircraft.

TRANSPORT FORMATION: During the Duke's visit to Brough, three Beverleys from Abingdon crossed the airfield in line astern, followed by another which gave a load-dropping demonstration (see above).



Turbulent on View

FLOWN from Villacoublay, Paris, to this country for a three-week demonstration tour, Druine Turbulent F-PHFR landed at Elstree aerodrome last Sunday afternoon, April 8th. It was piloted by Mr. Harold Best-Devereux, a senior surveyor of the Air Registration Board and a committee member of the Popular Flying Association, which is encouraging the amateur construction of Turbulent and two-seater Turbi aircraft in this country and the Commonwealth.

The flight from Villacoublay, *via* Le Touquet and Lympne, took 3 hr 45 min flying time. Average air speed was between 70 and 75 m.p.h., and 6½ gallons of fuel were consumed by the 27 h.p. Volkswagen engine during the trip. The aircraft is expected to visit various flying clubs and light-aircraft groups in the South and Midlands during its three-week stay in this country.

The Turbulent and Turbi are the first two designs authorized by the Popular Flying Association for amateur construction under the special U.K. airworthiness requirements for ultra-light machines. Much interest has been shown by enthusiasts in Canada, Australia, New Zealand and South Africa, as well as in Britain. Estimated cost of an amateur-built Turbulent is about £350; working drawings are available from the Popular Flying Association at Londonderry House, 19 Park Lane, London, W.1.

"H.P.'s" Review

A REVIEW by Sir Frederick Handley Page of activities of Handley Page, Ltd., for the year ended December 31st, 1955, includes this characteristic summary of the airliner position:—

"Britain's airliners are widely criticized for their inability to sell in world markets. Nevertheless, a recent estimate shows that 25 per cent of the output of British industry (by value) is civil. Thus, even in the security-conscious world of today, Britain attempts a reasonably balanced aeronautical programme, which makes a big contribution to the export drive.

"The vast size of the home market for American airliners is rarely appreciated; it includes large military orders as well as those from its airlines. United States military orders for the Stratocruiser, the Constellation and the Boeing 707 have all exceeded domestic airline orders for these types. These, in their turn, have exceeded overseas orders.

"But in Britain military orders for airliners are few; the domestic market consists significantly only of two national airline corporations. Overseas orders, on which British manufacturers must depend if their civil aircraft are to be produced in quantity, are in general placed only when airliners have been proved in service.

"Here is a national problem. Private-venture development of mainline transports is no longer the answer; it is prohibitively expensive today. Two solutions are possible. One is to give Government assistance to independent operators; this will enable them to buy modern aircraft. The other is to re-equip Transport Command . . .

"At present few aircraft are on order for Transport Command; both in numbers and ability they are inadequate. Very-long-range modern aircraft are needed to meet the latest strategic requirements. For example, they should be able to make express trooping flights from Britain to Singapore with only a single en-route stop. Such aircraft could well have great advantages for civil operations and enable British manufacturers to produce an effective reply to the latest long-range American jetliners."

Talking and Planning Missiles

TALKS are shortly to be held in Australia between representatives of the British and Australian Ministries of Supply. The British delegation is being led by the Parliamentary Secretary, Mr. F. J. Erroll, and the Australian Minister, Mr. Beale, will also take part in the discussions. The talks will last up to a month and will concern the joint British-Australian long-range weapons programme with particular reference to future trials at Woomera.

Further news is now available on the upper-atmosphere research rockets which will be launched from Woomera and Great Britain during the International Geophysical Year in 1957-58. These will be the first British sounding rockets to be launched and their development is in the hands of the Royal Aircraft Establishment, assisted by scientists from universities and industry.

Each vehicle will be powered by a solid-fuel rocket and will weigh about 2,500 lb at launching, the latter taking place from an 81ft tripod weighing 32 tons. The launching direction will be variable but will normally be substantially vertical. Early versions of the rocket will be designed to carry 150 lb of instruments to just over 100 miles altitude, but later versions are expected to reach 130 miles.

Some details are also available about the programme to be followed. University College, London, will obtain information about winds, temperatures and pressures by firing a series of grenades from the rocket at a number of chosen altitudes, and will also measure the masses of electrically-charged particles in the upper atmosphere. Birmingham University will investigate different methods of sampling and will measure electrical conductivity. Queen's, Belfast, plan to study the emission of light resulting from the release of sodium and potassium vapour, while University College, Swansea, is working on two methods of measured ionospheric electron densities concurrently with similar measurements on the ground. The R.A.E. will study surface temperatures on the rockets and are also developing an automatic sun-seeking device of the type already being used in America.

On the Mark

HELICOPTERS have more than once been used as cranes for the erection of building structures abroad, but the recent employment of a Bristol Sycamore in this way is believed to have been the first example in this country. The task was the erection, for Trinity House, of a navigation beacon on a rock outcrop 400 yards off Penmon Point, Anglesey. The granite and concrete base, a truncated cone 25ft high, had already been erected, and the helicopter's first task was to fly the 7½-cwt steel mast from the mainland and lower it into position on the base, so that the erectors could secure it with bolts. The second stage of the operation was to transport the topmark, a 3½-cwt lattice steel strip structure, and lower it on to the mast in readiness for bolting into position.

These two sorties, which went without a hitch, saved what might have meant weeks of work, especially had a prolonged spell of bad weather occurred. Without the helicopter's aid the steelwork would have had to have been ferried to the rock against a nine-knot current and hoisted into place with the aid of derrick poles. The Sycamore, G-AMWI, operated by Autair, Ltd., was flown by Bristol test pilot Peter Moore, and Alec Langfield, Bristol sales demonstration engineer, flew with him to give positioning advice at the crucial moments.

French Aircraft in Australia

SOME 800,000 people visited Sydney Royal Easter Show in the first seven days and saw, among other exhibits, a strong representation from the French aircraft industry. A number of aircraft were shown, some in model form and—"in the flesh"—the S.N.C.A.N. Noratlas, S.N.C.A.S.O. Djinn helicopter and the Max Holste Broussard.

A French correspondent writes that "French aircraft were exhibited not only throughout the Show as part of the important

CROWNING CEREMONY: The Bristol Sycamore deposits the topmark on the mast of the Penmon Point navigation beacon (see col. 1).

French participation, but a number were demonstrated in flight over Melbourne and Canberra. The S.O. 1221 Djinn helicopter, piloted by Eric Fourcaud, made a great impression on the Australians and the machine seems to have a place in both civil and military applications there. Numerous enquiries were received about the Sipa Coccinelle and Max Holste Broussard, both of which seem to be particularly well suited to the needs of the country.

"M. Georges Hereil, president and director-general of S.N.C.A.S.E., who had come specially to Australia, had talks with the directors of the major Australian air transport companies, and it is not impossible that the twin-jet, medium-range Caravelle will be ordered and fly in Australian colours in the near future. As M. Hereil pointed out to the Rt. Hon. R. G. Menzies, the Australian Prime Minister, the Caravelle has an advantage for operation in Australia since its Avon engines are already known and being used by the R.A.A.F.

"Leading Australian personalities saw the Djinn, Broussard and Noratlas flying in both Melbourne and Sydney. Mr. Athol Townley, Air Minister, and Mr. Don Anderson, Director of Civil Aviation, both flew in the Djinn."

The Djinn and Broussard, dismantled and packed aboard two Noratlas transports, left Australia for Djakarta, Indonesia, on March 29th, ready for demonstration there on April 3rd.

AUSTRALIAN DEMONSTRATION: The S.N.C.A.S.O. S.O.1221 Djinn helicopter, in Australia for the Sydney Royal Easter Show (see paragraph on this page), demonstrates its manœuvrability in relation to two people standing on the tarmac. In the background is one of two Noratlas in which the Djinn and a Broussard were flown out.

FROM ALL QUARTERS . . .

Australian Post

G/C. E. A. Whiteley, who, as announced last week, has been appointed a director and general manager of the Bristol Aeroplane Co. (Australia), Pty., Ltd., in succession to the late Mr. C. H. Tucker. An Australian, he has a distinguished record in the R.A.F. both during and since the war.

F.A.I. Awards

THE Fédération Aéronautique Internationale has announced, through the Royal Aero Club, that Paul Tissandier Diplomas for 1955 have been awarded to the following:

Mr. Edward C. Bowyer, C.B.E., for his work as director of the Society of British Aircraft Constructors.

Mr. Leonard L. Bridgman, in recognition of his work as the editor and compiler of *Jane's All the World's Aircraft* since 1941, and compiler since 1920.

Mr. Philip B. Mayne, in recognition of his work as timekeeper and starter to the Royal Aero Club.

W/C. William R. Parkhouse, in recognition of his 28 years' service to civil aviation.

W/C Parkhouse is noted for his pioneering work in connection with aviation in the West Country. After serving in the R.N.A.S. and R.A.F. he established and operated the Haldon School of Flying at Teignmouth in 1928, and has been manager of Exeter Airport since 1938. He is a founder member of the Guild of Air Pilots and Navigators, and holds Instructors Certificate No. 1 of the Guild.

The diplomas are in memory of M. Paul Tissandier, who was secretary-general of the F.A.I. from 1905 to 1945, and are awarded to those who, while not eligible for the F.A.I. Gold Medals, "have nevertheless by their influence, work, initiative and devotion, or in some other way, served the cause of aviation in general, especially private and sporting flying." The presentations will be made at the next Conference of the F.A.I. to be held in Vienna on May 17th.

New Avro Sales Manager

IT is announced that Prince Emanuel Galitzine, London office manager for A. V. Roe, Ltd., at Hawker Siddeley Group headquarters, has been appointed Avro sales manager. He will be moving to Manchester. Prince Galitzine has had a varied flying career. Brought to England when he was one year old, he was naturalized in 1933 and educated at Lancing College, Sussex, and Koenigsberg University, Germany. In 1939 he joined the Finnish Air Force as a pilot and trained on Gloster Gladiators and Bristol Bulldogs. Escaping from Finland to avoid capture by the Germans, he joined the R.A.F. in October 1941 and became a Spitfire pilot with No. 504 Sqn. and later with No. 611 Sqn. As a member of a special high-altitude Flight, he once intercepted a Ju86 at 43,000ft. This Flight later became No. 124 Sqn., and Galitzine's Commanding Officer was S/L. Jimmy Nelson, who subsequently served as an Avro test pilot for a number of years.

Prince Galitzine.

In a break from flying duties, Galitzine became personal assistant to A.V-M. W. F. Dickson (now Marshal of the Royal Air Force Sir William Dickson, chairman of the Chiefs of Staff Committee). He served at 83 Group headquarters and later accompanied A.V-M. Dickson to Italy when he took command of the Desert Air Force. In the summer of 1944 Prince Galitzine was back on operations with 72 Squadron and is believed to have been the first British pilot to land in the South of France, on D-Day +4. At the end of the war he returned to England, first on staff duties and later as a pilot with Transport Command. After the war, Prince Galitzine converted to jet aircraft with No. 601 (County of London) Sqn., R.Aux.A.F. He subsequently became an airline pilot with Air Services of India, later joining B.E.A. as a first officer on the Vikings which they were operating at the time.

U.S.A.F. Accident Rate

IN the face of newspaper criticism that has headlined the fact that accidents have cost 45 lives in two months, the United States Air Force has produced facts and figures to show that military flying is, in fact, becoming safer.

Following the eighth serious crash since January, when a Globemaster was lost in the Atlantic on March 2nd with 17 men on board, the Air Force has made statistics available which show that, proportionately, accidents are declining in the face of a vast expansion in flight operations.

For example, says the statement, an average of 360 Strategic Air Command bombers are refuelled in flight from aerial tankers every day—or one every four minutes—irrespective of the weather. It is also pointed out that some fighter bases have 1,400 landings and take-offs a day, or one every minute. Last year, U.S.A.F. aircraft flew more than two-and-a-half times as many hours as did U.S. domestic and international airlines, much of this flying being done under hazardous weather conditions and in complicated new aircraft types.

In spite of all this, the major-accident rate last year was 17 per 100,000 hours flown, three fewer than in 1954. There were four fatal accidents and nine fatalities per 100,000 hours, the same as in 1954, the lowest rates in Air Force history.

"A tentative check indicates that the accident rate so far this year is lower than it was at this time last year," the statement adds.

East German Production

SPEAKING in East Berlin last month, Herr Ulbricht, East German Deputy Premier and Communist Party secretary, referred briefly to the re-establishment of an aircraft industry. Overall industrial and economic planning is conducted, Russian-fashion, in five-year periods. The First Five-year Plan has just ended and, said Mr. Ulbricht, East German Airlines would "be equipped with Russian jet transports by the end of the second."

The first type of aircraft to go into production in East Germany since 1945 is the Il-14. A large number are being built in various factories, many of them no doubt being for Service use. The type is already in production in Czechoslovakia. Initial batches of German-built Il-14s are probably using Russian components; the first will fly very shortly. No mention was made of combat-type aircraft.

Fuji Activity

AN all-purpose liaison and light-cargo aircraft, the LM-1, which has been developed from the Beech Mentor, is among the products of the Utsunomiya division of Fuji Heavy Industries, Ltd., of Tokyo, which are described by the company in a recently produced brochure. The division has delivered, according to this source, "76 knock-down and domestic-make Mentors" to the Japanese government.

In addition to the licence-built Mentor trainers and Cessna L-19 Bird Dogs now being produced, a tactical armament trainer version of the Mentor is in production. The LM-1 is a four/six-passenger modification of the Mentor, available in either military or civil form. The military version is equipped for use on ambulance, photographic, general liaison and light cargo work, while the civil version, known as the LM-1 Nikko, is a luxury four-seat executive aircraft. Both versions have the same dimensions as the Mentor and are powered by the Mentor's 225 h.p. Continental flat-six engine. Gross weight of the LM-1 is 3,240 lb; sea-level cruising speed and endurance of 160 kt and 8 hr are claimed.

Among the company's other projects, an advanced stage is said to have been reached in its design work on a light jet trainer in the 7,000 lb gross-weight class. In co-operation with the Japan Jet Engine Company, the design and experimental manufacture of the JO-1 turbojet engine of 2,000 lb thrust has been completed by the Omiya division of Fuji, and testing of the first model is now being carried out. Three target aircraft powered by light petrol-engines and manufactured in 1954 are being tested by the Technical Research Institute of the Japan Defence Agency. Groundwork for guided-missile study is being carried out, three MA15F ramjet engines having been purchased for research and flight-test purposes. Experimental manufacture of a Mach 2.0-2.5 ramjet engine is being planned, and research studies are being conducted on liquid rockets.

Repair, overhaul and modification work to civil and military aircraft is also carried out at Utsunomiya Airfield, and plans have been made for an expansion of facilities here. "At the present stage," the brochure sums up, "the main objectives of our firm lie in the manufacture of propeller trainers, utility aircraft, liaison aircraft and light jet trainers. It is our eventual purpose to proceed to cargo aircraft, jet interceptors and guided missiles in the future."

Silver City's fine terminal at Ferryfield flies the Duke's personal Standard during his visit on April 5th.

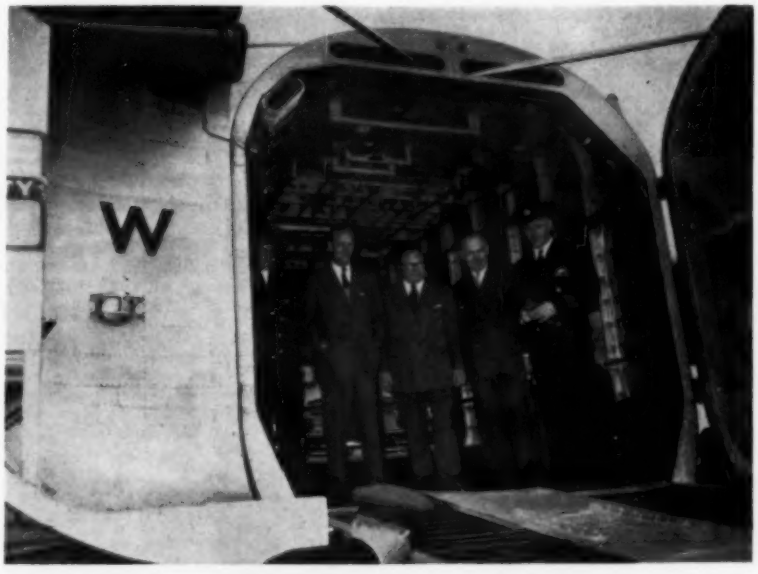
Duke of Edinburgh with Silver City

First Visit to a British Private Airline

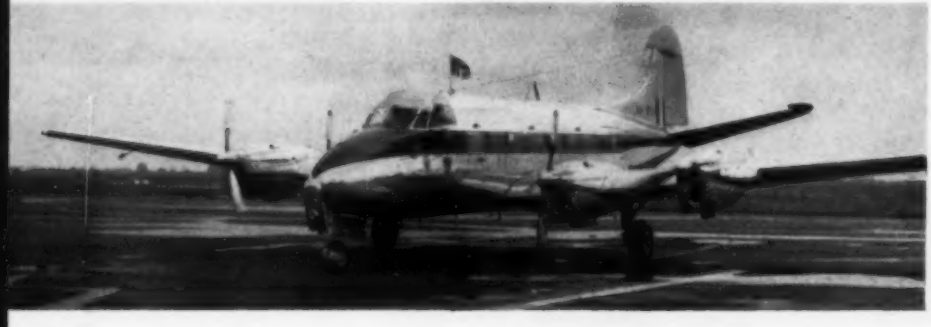
JUST before 1100 hr on Thursday of last week, the Royal Heron, piloted by H.R.H. the Duke of Edinburgh, touched down at Ferryfield Airport, Kent, and taxied to a stop by the terminal building between two Silver City Superfreighters. It was the Duke's first visit to a British private-enterprise airline—and, incidentally, an appropriate sequel to his presentation to Silver City last October of the Cumberbatch Trophy, the Commonwealth's highest safety award. The airline's cross-Channel car ferry was operating at its usual brisk tempo, and before sampling it for himself the Duke, with Mr. E. C. Mekie and A. Cdre. G. J. Powell (respectively Silver City's chairman and managing director) as his hosts, had a look behind the scenes.

Ferryfield—built in the first six months of 1954 by Silver City's contractors, Richard Costain, Ltd.—is notable for its clean and pleasing terminal building, and for its up-to-date and well equipped control tower, in which the Duke remarked on the similarity of the Decca installation to that in the Royal Yacht *Britannia*. He drove round the site of extensive new additions to Ferryfield's facilities (about which we hope to say more in a future issue) and looked inside the big maintenance hangar, where for a few moments work was suspended on the maintenance of a Wayfarer and a Superfreighter. Some thirty Silver City engineers, attired in what one newspaper afterwards described as "spotless" overalls, were presented, and it is reported that the Duke remarked to one: "I bet you take that nice clean overall off when I've gone."

Just before lunch, after an aperitif in the airport restaurant, the Duke boarded Superfreighter G-AMWD (in whose hold two export cars, a Sunbeam Rapier and a Triumph T.R.3, were loaded) for the 19-minute flight to Le Touquet. The pilot was Capt. D. Flett, Silver City's senior captain; and the co-pilot, who gave his seat to the Duke for the flight, was Capt. C. A. A. Hopkins. As the Duke was unfamiliar with the Superfreighter he left the take-off and landing to Capt. Flett, but he flew the aircraft at its scheduled height of 1,000ft *en route*. He was received at Le Touquet by Dr. J. Pouget, president of the French Aero Clubs, who at the informal lunch in the airport restaurant proposed the loyal toast; the toast to the president of the French Republic was proposed by Mr. E. C. Mekie, Silver City's chairman. At 1350 hr, on schedule to the minute, the Duke flew off in his Heron (which S/L. B. G. Stanbridge had brought over from Ferryfield), bound for London Airport for an appointment to inspect the control tower and approach-control system there.

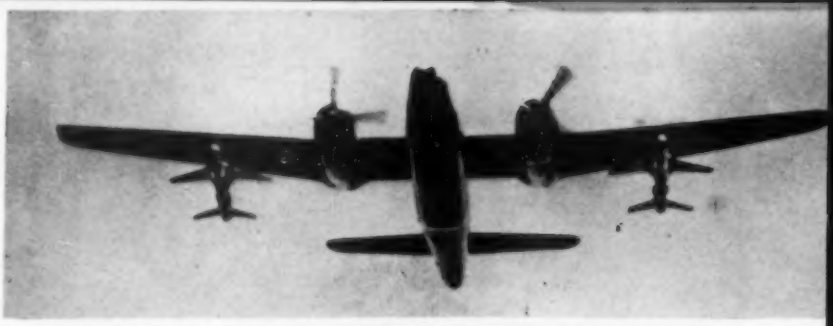


(Above) aboard Superfreighter "Whiskey Delta" for the flight to Le Touquet, with A. Cdre. G. J. Powell (centre), Silver City's managing director, and Mr. E. C. Mekie, chairman. The pilot was the firm's senior captain, Capt. D. Flett (left), with Capt. C. I. Hopkins (right) as co-pilot.



(Left) The Royal Heron, flown by the Duke, arrives at Ferryfield.

HERE AND THERE



AIR-TO-SURFACE missiles, known by the name Petrel and developed by Fairchild, are now coming into service with the U.S. Navy. The photograph shows a Lockheed P2V Neptune with a pair of these massive weapons (built round standard torpedoes), which are said partially to supplant the piloted attack aircraft. An anti-submarine version may also exist.

Shattering News

SOME thirty claims for damage to ceilings and glass reached the Ministry of Supply after the Fairey Delta 2's 1,132 m.p.h. record-breaking flight along the South Coast on March 10th.

High Spirits

A SMALL American non-rigid airship has been imported into Germany and is to be used for advertising the products of a German spirits factory.

Big Survey Contract

THE Photographic Survey Corporation—a Hunting subsidiary—has been given an important contract for air mapping 225,000 sq ml of the Caroni River area in Venezuela. The contract, issued jointly to P.S.C., to an associate company in Caracas, and to another Caracas company, is in connection with an electrical power scheme.

Export Record

DURING February, British aviation exports reached the highest level yet. No less than £8,049,307 worth of aircraft, engines and components were exported, almost a million pounds' worth more than in January, the previous record month, and some £4 million more than in February last year. The 1956 total available—£15,194,303 for the first two months—is £1,390,376 more than that achieved during the first *quarter* of 1955, itself a record year. Great Britain's best customer during February was the United States, which received £707,245 worth of aircraft. Egypt came next with £683,093, then Sweden (£512,390) and Australia (£507,217). No fewer than 30 countries bought British aircraft, excluding "other Commonwealth countries" (£39,322) and "other foreign countries" (£1,112,345). More than £2½ million of the February total consisted of engine exports, a figure which takes no account of royalties received from licence agreements.

Their Own Petard

PUBLICITY has recently been given in West Germany to a story that a raid on Freiburg on May 10th, 1940, was made by the Luftwaffe, which was under the impression that it was bombing the airfield at Dijon.

"FLIGHT" NEXT WEEK

NEXT week's issue of "FLIGHT," dated April 20th, will be a special Civil Aviation Number. Reviewing world operations in very considerable detail, it will include much material that will be valuable as a work of reference, and will be profusely illustrated.

Sir Miles Thomas's New Post

ANNOUNCING the appointment of Sir Miles Thomas as full-time chairman, Monsanto Chemicals, Ltd., have stated that he will take up his new post by July 1st. Their announcement added that he would "continue his duties with B.O.A.C. until his successor as chairman has been selected and appointed." Sir Miles's resignation from B.O.A.C. was announced on March 20th.

Rocket Motor Test Site

A MINISTRY OF SUPPLY scheme to acquire 8,000 acres at Spadeadam Waste in Cumberland as a static testing ground for rocket motors was discussed at a Carlisle meeting last week. It was stated that tests would involve "intensified noise" for periods not exceeding three or four minutes about four times a day.

"Flight" Index

THE index to the July-December, 1955, volume of *Flight* is now available, price 1s (by post 1s 2d) from Iliffe and Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Half-yearly volumes can be bound at a price of 24s, this including binding case and index; or case and index are available separately, price 7s 6d (by post 8s).

TV Turbulent

AN interview with C. M. Lambert of the editorial staff of *Flight* was a feature of the B.B.C. *Highlight* television programme last Monday evening. He had been invited, at a few minutes' notice, to give first-hand impressions of the Druine Turbulent and other French home-construction light aircraft. As recorded on page 406, a Turbulent is now touring Britain.

Dowty Group Directorship

IT is announced that Mr. R. F. Hunt has been appointed to the Board of the Dowty Group. His duty will be to assist the chairman, Mr. G. H. Dowty, and he will retain his presidency of Dowty Equipment of Canada, Ltd., travelling between the two countries as occasion demands. Mr. Hunt joined Dowty Equipment, Ltd., as an apprentice in 1935, served in R.A.F. Technical Training Command during the war, and was export manager of the company from 1945-49, when he went to Canada.

Honoured by S.A.E.

AMONG awards presented at the National Aeronautic Meeting of the Society of Automotive Engineers in New York this week was the Wright Brothers Medal. The recipient was Mr. Wendell E. Reed, a project engineer with the Solar Aircraft Co., and inventor of the Microjet control. His paper, *A New Approach to Turbojet and Ramjet Engine Control* (summarized in *Flight* of December 2nd, 1955), was adjudged the best S.A.E. aeronautical contribution in 1955. The Medal—only 25 of which have been awarded since 1928—is "for outstanding contributions to existing knowledge of aeronautics."

V.I.P. VISCOUNT: This personal transport for the President of Pakistan, a Viscount 734, left Lyneham on Friday, April 6th. Luxuriously appointed, it is fitted with slipper tanks for increased range. In the group, photographed during crew training at Wisley, are (left to right) F/L. Majid Baig (navigator); S/L. Z. A. Khan (captain and personal pilot to the President); Capt. R. Rymer (Vickers-Armstrongs test pilot); F/O. Masood Khan (second pilot); and F/L. N. A. Siddiqi (radio operator).

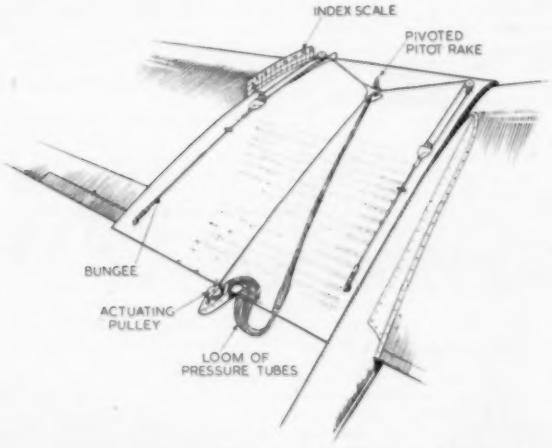
LAMINAR FLOW AT RADLETT

Long-term Project Revealed by Handley Page

LAST week we announced the completion of the new aircraft-erection hall at Handley Page's Radlett airfield. In doing so we made brief reference to the company's work in the field of laminar-flow research and it is now possible to describe this work in some detail.

The fact that the company have been engaged in such work has long been known and the director of research, Dr. G. V. Lachmann, read a paper on the subject before the Royal Aeronautical Society which was fully reported in our issue of November 11th, 1954. The work has been conducted under Ministry of Supply contract and is directed towards the development of a practical engineering system for the achievement of low-drag laminar air flow over the wing of otherwise conventional aircraft. Following extensive tunnel testing, and other laboratory research, Handley Page were given the use of the prototype D.H. 113 (Vampire Night Fighter) which has been flying on laminar-flow research since 1953.

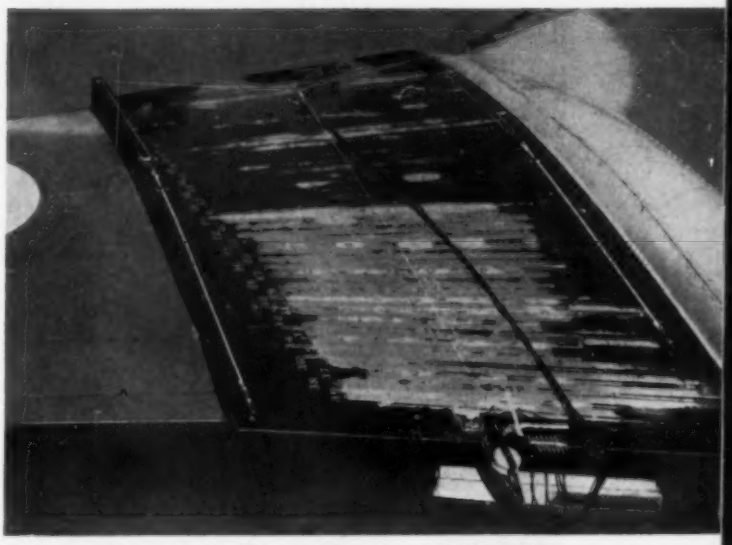
Handley Page have modified the basic two-seat Vampire airframe by the addition of a special test-section "glove" 5ft wide mounted on the upper side of the port wing outboard of the air intake and tail boom. A dummy glove wing of similar profile is mounted on the starboard side to preserve the symmetry of the aircraft.



(Above) Although it may at first sight appear primitive, the trans-chord pitot rake is the result of considerable evolution and refinement. It has been found to behave perfectly at up to at least 300 kt indicated.

The glove at present in use is the third actually to be mounted on the Vampire, and has been found to be the most efficient. It is made of light-alloy sheet formed to very close tolerance and carefully drilled with 39 spanwise suction strips each composed of nine rows of very small holes, as shown in the accompanying diagram. The geometry of the perforations has been carefully chosen to permit the use of spanwise stiffening members (such as are used in the company's sandwich skins) and the complete glove has been carefully flush-riveted to its supporting structure and filled and ground to preserve the smoothest possible profile over the test surface.

Beneath each triple row of holes is located a narrow spanwise duct through which a portion of the boundary layer across the upper surface of the wing can be drawn. Each suction duct is connected through a metering orifice to a common manifold which is then coupled to a suction pump powered by an air turbine running on air bled from the compressor of the Goblin turbojet. The capacity of this suction pump (which has been modified from a Godfrey cold-air unit) is actually too large for the area of test surface employed and is therefore inherently liable to surge. This disadvantage could have been counteracted by a simple bleed, but a better solution was found to be an increase in the size of the suction holes over the inboard portion of the experimental surface.



On the experimental Vampire the test "glove" is mounted on the port wing immediately outboard of the tail boom. Handley Page's chief aim in this research is the evolution of a practical laminar-flow surface which can also form part of the actual wing structure.

During each test flight it is possible to vary the total suction by adjusting a valve which controls the overall quantity of air tapped from the engine to drive the suction pump. In addition, it is possible to alter the distribution of suction between the 39 individual strips by changing the sizes of the metering orifices which are inserted in the duct between each strip and the common manifold. This is done on the ground between test flights.

Comprehensive experimental recording equipment is installed in the Vampire, including an auto-observer panel upon which can be recorded the altitude, airspeed, suction mass-flow, suction pressure and boundary-layer velocity profiles. The latter are determined by means of a special pitot rake, for which Handley Page have evolved a novel, but perfectly satisfactory, mechanism by means of which the rake can be positioned at any of a number of chordwise stations. It is believed that this is the first time that a pitot rake has been developed which can be traversed right across the chord of, and in contact with, an experimental wing. The rake itself consists of a series of flattened hypodermic tubes superimposed upon one another to record the velocity profiles at given distances from the wing surface. Each pitot head is connected to a thin rubber tube, the complete loom of these tubes being gathered in a bundle which hangs freely behind the trailing edge in the manner shown in the accompanying drawing.

As this drawing also shows, a small electric motor is mounted beneath the trailing edge of the experimental glove and drives the actuating pulley which pulls back the pitot rake by means of a thin nylon cord. The rearward movement of the rake is restrained by a cable-and-pulley system connected on each side to a length of bungee cord maintained in tension. The pitot rake itself is independently pivoted about a spanwise axis so that the pitot comb itself always faces directly into the on-coming air flow. Two of the tubes are connected to a pressure gauge and act as a laminar-flow indicator in that they show precisely at which point the thin, low-drag laminar boundary layer breaks away from the wing surface and becomes a high-drag layer of turbulent flow and greater thickness.

A considerable amount of test flying has already been logged on this aircraft, including approximately 50 hr with the present

This diagram reproduces, approximately life size, two of the "triple-triple" rows of suction holes which on the test surface run in a spanwise direction.

LAMINAR FLOW AT RADLETT . . .

third glove in place. Most of the flying has been done at around 10,000ft at about 250 kt i.a.s. (300 kt has been reached), and no trouble has been experienced as a result of flying in all kinds of British weather conditions. It is true, however, that the company have not yet tested the system in excessively dusty atmospheres—such as might occur during Middle East sandstorms—in which conditions it is conceivable that the suction holes could become blocked by induced solid matter. It is known, however, that no sudden breakdown of flow would occur were the suction system to fail. Tests have been carried out in which the suction system has been suddenly shut off after the Vampire had been trimmed to fly straight and level, hands off, with the system in operation. The pilot had no difficulty in maintaining complete control of the aircraft, although there was a pronounced rolling tendency as a result of the decrease in lift of the experimental glove.

Results to date amply justify all the expectations of Dr. Lachmann and his research team A remarkable reduction in boundary-layer thickness has been achieved as a result of suction: the turbulent layer, 1.76in thick, has been replaced by a laminar layer only 0.18in thick. Typical results for drag per foot run of the test surface are: turbulent skin drag, 3.98 lb; laminar skin drag, 0.325 lb; and drag equivalent of pump work, 0.390 lb. This means that the total laminar drag amounts to no more than 0.715 lb per foot run, which is less than one-fifth of the original skin drag without suction. Put in another way, Handley Page have succeeded in reducing the skin friction over the glove by 82 per cent by maintaining laminar flow across the test section.

Admittedly it would be more difficult to achieve such results on a highly swept wing. The flow over swept wings is of a more complex nature, since other types of boundary-layer instability are involved and, in consequence, rather more suction power would be needed to achieve comparable results. The company look upon their work in this sphere as being of an essentially long-term nature. It is expected that the next stage will be to fit an aircraft with complete experimental wings, which should enable even more convincing results to be obtained. Nevertheless, Handley Page do not envisage boundary-layer control of this type being applied to existing aircraft as a modification. Its primary application is foreseen in the long-range transport sphere. It is expected that, by employing such an arrangement to maintain laminar flow across the wings, the system could reduce the size and weight of transatlantic jet transports by over 30 per cent, provided the aircraft were designed to include the system from the outset.

TWO AMERICAN FLYING FILMS

WITH offerings such as *Twelve O'Clock High* and *The Bridges of Toko Ri* the Americans have established a reputation for first-class films about flying. This reputation they unfortunately jeopardize at regular intervals with some very bad material.

Two new films which, for different reasons, are well worth seeing are about to be shown in London. *One Man Mutiny* (general release May 7th) starring Gary Cooper as Gen. "Billy" Mitchell, gives a supposedly historically accurate account of that personality's court martial and dismissal from the U.S. Army Air Corps in the 1920s. The acting of Gary Cooper as Mitchell and of Rod Steiger as the Army's prosecuting counsel is superb, and the story of the court martial and the events which led up to it are well set out. But those who seek accurate flying material in terms of vintage aircraft will be to some extent disappointed. In the early part of the film, the period being about 1922, Gary Cooper flies in a Grumman single-float amphibian, whereas this type of aircraft did not see service till many years later. He then leads a flight of so-called bombers for the fateful attack on the German battleship which he sank as a demonstration. But instead of Martin M.B.2s these turn out to be a D.H.9 and a Curtiss JN-4D "Jenny" (the latter re-engined with a Ranger in-line which makes it something of a spotter's headache)—and these aircraft are supposedly each carrying two 2,000 lb bombs! Nevertheless, the film is well worth noting by those who would like to see vintage aircraft flying for a short time and a very fine dramatic performance for the remaining 60 minutes or so.

The other film, due to open yesterday, April 12th, at the Rialto cinema, Coventry Street, is called *On the Threshold of Space* and deals with the research being carried out by U.S.A.F. aero-medical authorities into the physiological problems of baling out at very high altitude and sonic speeds. It is in Eastman Colour and CinemaScope, and quite outstandingly good.

The main theme is the development of pilot-escape equipment for the X-125 rocket-powered, supersonic, high-altitude research aircraft, in which the use of a capsule is not possible. The aircraft itself is hypothetical but by no means far-fetched and the stages of research into the problems of escape from it are those actually undertaken by the U.S.A.F. for other projects. In fact, the final sequence deals with a test with a balloon capable of carrying a man to a height of 100,000ft so that he can make a delayed-opening parachute descent; and such a test is in fact to be made later this year from just such a balloon with just such a purpose. The film gives accurate details of U.S.A.F. research so far carried out, first with the downward ejection of the bombardier of the B-47, then with the rocket-propelled sled and finally with the balloon.

Superb photographs of B-47s, downward ejections and bodies in free fall are followed by a sight as impressive as anyone wishes to see—the rocket sled hurtling past the camera (and straight at it) as it accelerates to about 900 m.p.h. and then roars and screeches to a standstill in the water brake. There is plenty of "five, four, three, two, one, whoosh . . ." about this film, but—relief for the science-fiction weary—the material is solid fact and excellently presented. Apart from omissions presumably made for security reasons, it shows the difficulties met and gives an idea of the calibre of men who have done the "guinea pig" work.

The background story, at Hollywood strength, is to the formula of "girl marries guinea pig and reluctant scientist vindicates his courage"; but it is not so sickly as to make the film wearisome and does give a *leitmotif* which holds the story together well. It is, incidentally, pretty forcefully demonstrated that neither the resources nor the climate and scenery for either a film of this calibre, nor even for such research, are available in this country. For aviation interest and fine photography *On the Threshold of Space* should definitely not be missed.

LONG-RANGE WEATHER COMPUTING

FOLLOWING successful experiments with an electronic computer for daily predictions of weather and computing flight-paths for commercial aircraft (*Flight*, March 23rd, page 320), the United States Weather Bureau has formed a special research unit to predict weather several days or even weeks in advance.

Instructions to the electronic computer (an IBM 701) for the required calculations have been coded during recent weeks and the unit is shortly to be in full operation.

The first trial model computer for the new service was designed by Dr. Norman A. Phillips, of the Institute for Advanced Study, at Princeton University, and has been successfully giving weather patterns for up to three weeks ahead. Certain changes intended to improve accuracy are now being made, and once the machine is "instructed" on how to perform its calculations, it is expected that it will be able to make forecasts for at least 30 days ahead, or possibly through one period of what meteorologists call the index cycle—that is, long enough for the general characteristics of air flow to repeat themselves at least once.

Dr. Joseph Smagorinsky, chief of the Weather Bureau's general circulation research section, who is in charge of the experimental project, explained that at one point in the index cycle atmospheric flow is zonal, or relatively parallel to the Equator. This pattern gradually breaks down until large troughs and ridges are formed and the atmosphere is comparatively turbulent. The time required for these changes from smooth to turbulent flow and back again is not predictable. If the time required to complete an index cycle were known, long-range forecasting would be facilitated.

Dr. Smagorinsky said the unit's work was twofold: (1) To construct, with what was now known, a mathematical model of the atmosphere that would reflect its actual state over a period of weeks as accurately as possible; and (2) to make fundamental investigations of such phenomena as the effects of changes in solar output on weather, and of the formation of clouds, with the aim of being prepared to make more accurate numerical predictions.

The research unit, operated by the U.S. Weather Bureau, receives financial support from the Office of Naval Research and the Geophysics Research Directorate. Its activities are guided by an advisory committee consisting of Dr. Harry Wexler, the Weather Bureau's director of meteorological research, and Drs. John von Neumann and Jule Charney, of the Institute of Advanced Study, Princeton University, where studies on numerical weather forecasting were pioneered.

26,132,012 miles

were flown by BEA aircraft during the year ending January 31st, in serving 67 airports in Great Britain, Europe and North Africa. In the course of these operations BEA carried 2,174,333 passengers—234,412 more than in the previous year.

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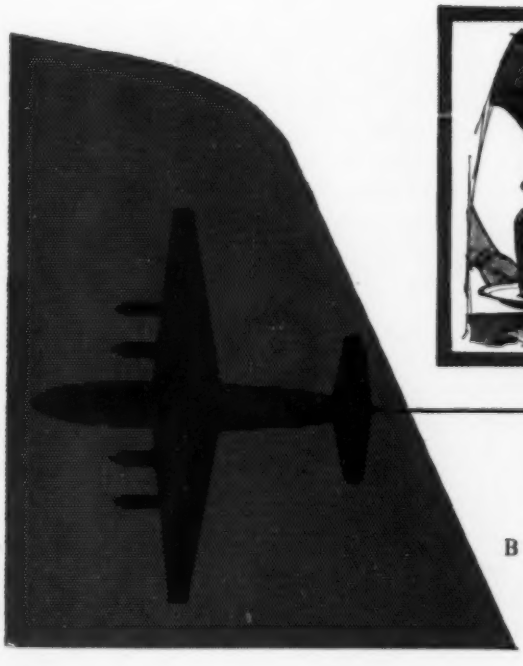
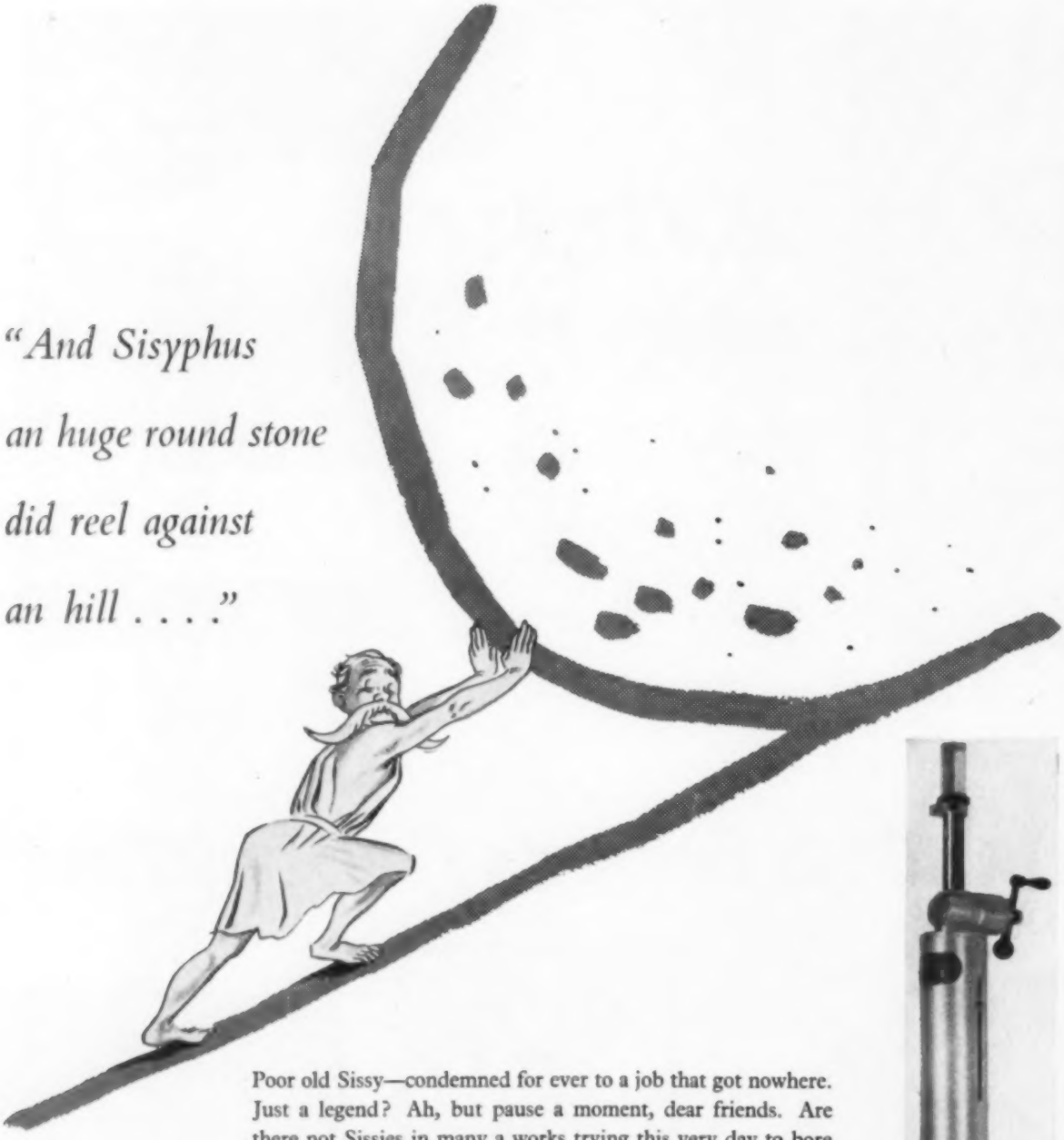
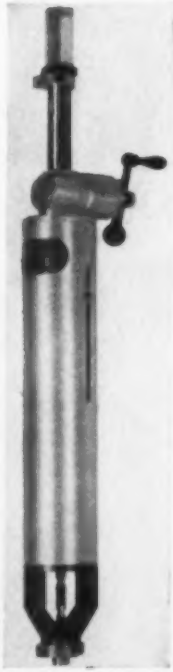


BRITISH EUROPEAN AIRWAYS

"And Sisyphus
an huge round stone
did reel against
an hill . . . ."





Poor old Sissy—condemned for ever to a job that got nowhere. Just a legend? Ah, but pause a moment, dear friends. Are there not Sissies in many a works trying this very day to bore half-inch holes through tough metal with the wrong tool?

Alas, alack, there are indeed. Indeedy yes!

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CRC272

THE GALTIER DELTA FAMILY

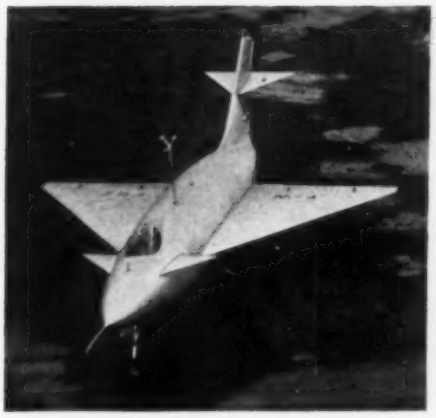
A Note on the Nord Gerfaut I, its Forbears and its Portents

THE designer of the Gerfaut, M. Jean Galtier, trained as an aeronautical engineer in the early twenties and started his career with the Bernard company. He worked there for over ten years, finally designing the famous *Grand Raid* types, the 191GR and 80GR. The latter, built for Jean Mermoz, was developed into the 90BR bomber. When the Bernard company finally folded up in the mid-thirties M. Galtier went to Fouga, where he designed a three-engined transatlantic aeroplane, which, although approved by the Ministère de l'Air, was never built.

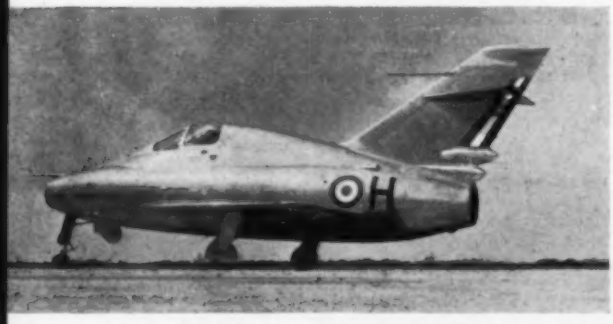
It was, then, in 1937 that M. Galtier joined the Arsenal de l'Aéronautique* (equivalent to our one-time Royal Aircraft Factory) at Chatillon-sous-Bagneux under the late General Vernisse. In this association he designed a series of neat fighters: the VG-30 with the Hispano Suiza 12X, the VG-33 with the Hispano Suiza 12Y and the VG-39 with the more powerful 12Z, claimed to have a speed of 400 m.p.h. The VG-36 was a high-altitude variation on the theme, with a special 12Y engine.

Immediately after the war M. Galtier, actively encouraged by General Vernisse, pursued an original line of jet-aeroplane development. The VG-70 of 1946, with a modified Jumo 004, was an advanced swept-wing design, notable for its ventral air intake. This was followed in 1950 by the VG-90, a rather large naval

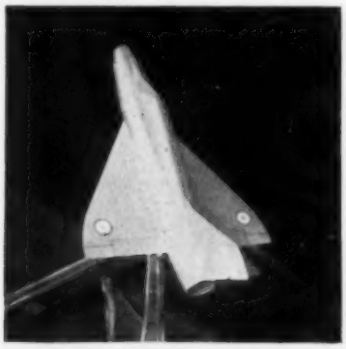
**On January 1st, 1953, the Arsenal de l'Aéronautique became the S.F.E.C.M.A.S., an associate of the S.N.C.A. du Nord but managed independently by General Vernisse. After his death it was completely amalgamated with Nord on January 1, 1955.*



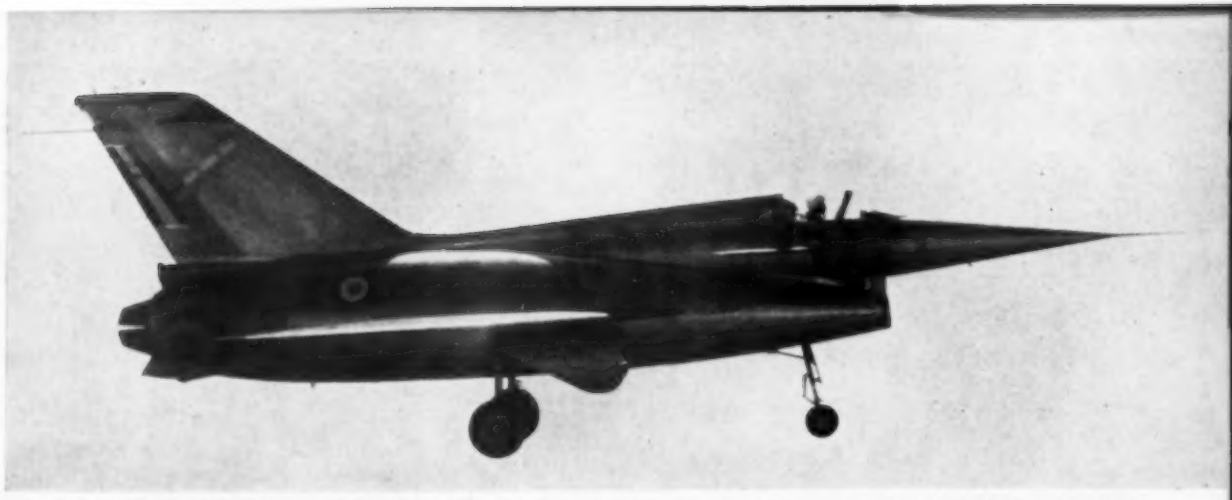
The S.F.E.C.M.A.S. Ars.1301 glider just before final flight-testing with its nose-plane fitted and its tail-plane retained as a precautionary measure. (Below) The S.F.E.C.M.A.S. 1402 (later named Gerfaut) at the time of its first taxying trials in late 1953.



The S.F.E.C.M.A.S. Gerfaut during its flight trials, fitted with an anti-spin parachute above the brake parachute. (Right) The Gerfaut with its large-area wing. The only other apparent change is the fitting of an Atar with afterburning, as revealed by the jet-pipe nozzle.



Area ruling? The Gerfaut at Le Bourget last year with a large tail blister, two rows of vortex generators round the fuselage and supplementary under-fins. (Right) Gerfaut II? The model on the S.N.C.A.N. stand at the 1955 Paris Salon. The size of the jet orifice is most marked, suggesting an advanced form of afterburning. The wing-tip shape is different from that of the Gerfaut I and the ailerons are not inset.



First prototype Nord 1500 Griffon canard (tail-first) delta-wing, missile-armed intercepter. The power unit is a S.N.E.C.M.A. Atar 101E.

THE GALTIER DELTA FAMILY . . .

jet fighter, designed for a Nene or Tay fed by lateral intakes. Both were shoulder-wing aeroplanes at a time when the low wing was almost universal. Unfortunately, the Arsenal lacked an experienced jet pilot for the VG-70, so that little flying was done on it; and both flying prototypes of the VG-90 were lost, one through control-booster failure and the other due to the undercarriage uplock releasing during a fast, high-g manœuvre.

M. Galtier's next venture followed an equally novel aerodynamic line. Asked to devise a short-range intercepter combining rapid climb with high speed, he adopted a delta layout as the best solution for obtaining sufficient wing area for climb and manœuvrability with the necessary low thickness/chord ratio to delay compressibility-drag-rise and yet give sufficient structural depth for stiffness. Having decided on a delta for compactness, M. Galtier went further in this direction and virtually designed the aeroplane round a straight-through duct for a S.N.E.C.M.A. Atar turbojet, with the load-carrying part of the fuselage added as a superstructure. The use of elevators and ailerons on the wing trailing edge in addition to a trimming tailplane is an unusual, and apparently highly successful, combination.

M. Galtier is a very retiring individual and one given to long and careful thought around a subject. He conveys the impression of being extremely objective and careful to a degree. The Gerfaut programme was based, therefore, upon full-scale glider testing as well as upon normal wind-tunnel work, and so a wooden glider, the Ars.1301, was built (actually, it was originally made for a supersonic rocket-fighter project, the Ars.2301, which was abandoned). For the Gerfaut programme the glider's swept wing was replaced by a delta, flown both with and without a trim plane.

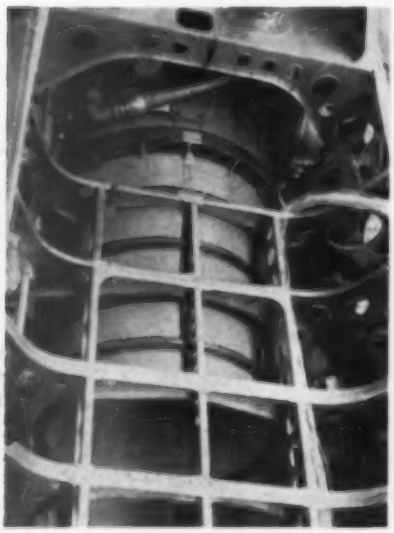
The design and construction of the Gerfaut, which was a complete break with all M. Galtier's previous work, was remarkably rapid; design started in September 1952, the prototype was completed on September 26th, 1953, the first taxying trials were made on October 20th, and the first flight on January 15th, 1954. On August 3rd Mach 1 was exceeded in level flight without afterburning—the first occasion on which this was accomplished.

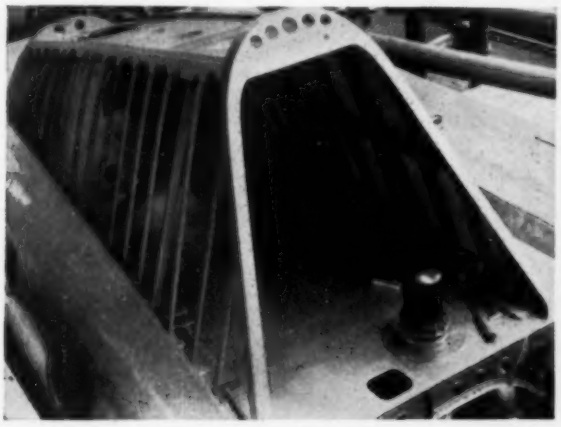
The key factor in the high performance of the Gerfaut is certainly the straight-through engine duct, which is truly circular from nose to tail. This allows the Atar 101D to develop its full thrust of 2,800 kg (6,200 lb) with minimum duct losses. The moderate gross weight of the Gerfaut, at 4,750 kg (10,470 lb), results in a low thrust loading. One curious fact is that construction was pressed on so rapidly that the "high-speed" wing, with a span of 6.5 m (21.4ft) and area of 19 sq m (204 sq ft), was finished before a "low-speed" one of 7.5 m (24.6ft) span and 26.2 sq m (282 sq ft) area. The original intention was for the pilot to gain experience with the larger wing and then to fit the small one for high speed. However, fortified by some hours of practice on the Avro 707C at Boscombe Down, the S.F.E.C.M.A.S. chief pilot, M. André Turcat, carried out all the initial trials with the small wing.

Both the smaller and larger wings have a sweep of 57½ deg and a thickness of 5½ per cent, so that their wave-drag characteristics are similar. Despite the greater frontal area the Gerfaut remains a level-supersonic aeroplane without afterburning, although the engine is now so equipped. With the larger wing go medium-, instead of high-pressure, tyres and greater operational flexibility.

The superstructure cockpit and V-windshield confer a profile similar to that of some of the fast American types. The "sweep"

(Left) View from above of the air-intake duct, with the cockpit-floor support structure. At the top of the picture can be seen the intake lip of the Atar and above it the fuel tank platform, with mounting for an immersed pump. (Centre) The pressure cockpit, which, built separately as a superstructure, is mounted on top of the engine duct. The Gerfaut was one of the first aeroplanes to have a raked knife-edge windscreen. (Right) The fairing behind the cockpit also forms the fuel tank. In addition to the access holes, a filler cap, contents-gauge unit, venting and pressurizing pipes can be seen.





The tank superstructure is, unlike the cockpit, an integral part of the fuselage. Two self-sealing bag tanks are fitted, the main tank being in front of the bulkhead with the circular opening. Four small fuel cells, interconnected port and starboard, are also installed on each side of the air-intake duct under the cockpit.

General view of the cockpit. Instruments and controls are grouped, the former being in colour code. Flying instruments are centred in the NATO grouping. Port top is the machmeter, calibrated to 1.5. The starboard shelf carries engine and starting controls, with oxygen panel (removed) at the forward end. The stick is short, without a hinge, and fitted with a Nord stick-force recorder.

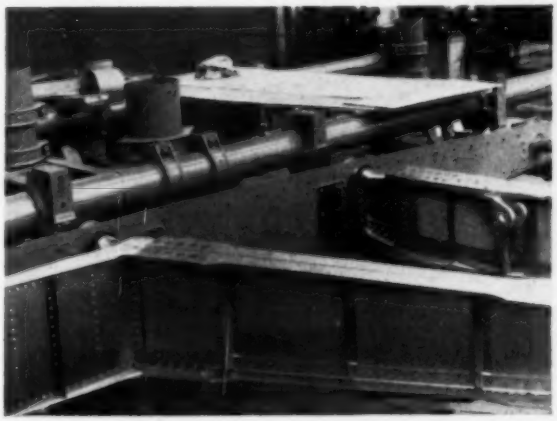
of the windshield must, in fact, be scarcely less than that of the wing, so that compressibility drag may not be high. The view, of course, is excellent, even at high angles of attack. The marked downward rake of the superstructure behind the cockpit coincides with the widening wing so that it may well approximate to area rule. This impression is heightened by the way in which the tail volume was increased last year by an enlarged parachute blister. Another modification, the addition of two rows of vortex generators, or turbulators (set at a number of different angles).

The wing structure presents an unusual feature in the spar layout. There are two main spars, roughly straddling the mid-chord point, between which the main legs retract. The front spar is swept back 28 deg and the rear spar 6 deg. There is also a spar very close to, and following the line of, the leading edge, and a control-surface spar lies parallel with the trailing edge. The rest of the structure consists of true fore-and-aft ribs and spanwise stiffeners, so that the area between each spar becomes a torsion box.

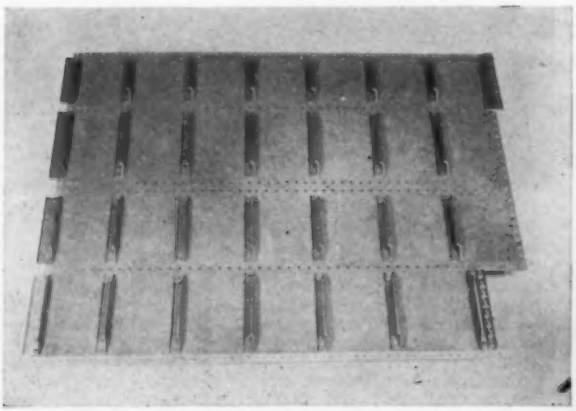
The photographs on page 413 show the sequence of development and modification of the Gerfaut I leading to the model which was shown at last year's Paris Salon. This is believed to be the Gerfaut II—which, obviously, will have a much more powerful turbojet. A drawing of this model has been published and on it the following dimensions are given: span 6.66 m (21.8ft), overall length 11.25 m (36.9ft), fuselage length 10.00 m (32.8ft), fuselage/tail height 3.55 m (11.6ft).

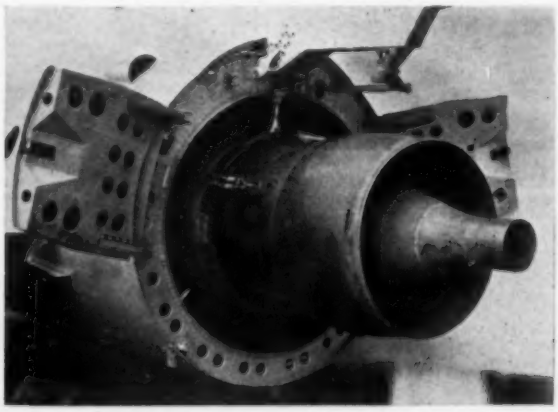
On September 1st, 1955, the Nord 1500 Griffon (originally Guépard) made its first flight. This is an unusual Canard delta which follows the last-known configuration of the Ars. 1300 glider.

The Griffon appears to be a logical development of the Gerfaut, using, once again, the straight-through engine duct and cockpit superstructure. The moving forward of the cockpit would help the air intake at high angles of attack. The forward trim plane is in keeping with the latest thought on supersonic flight. Its great

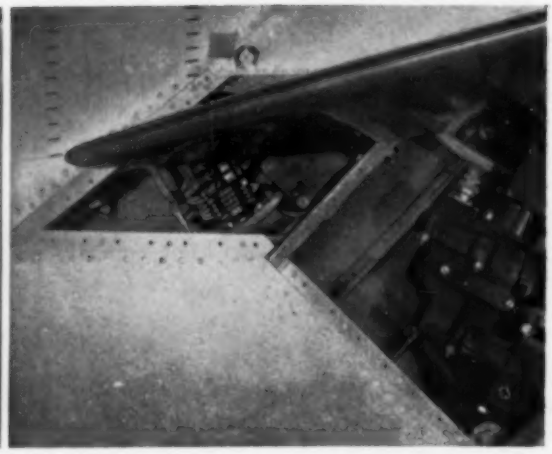


Part of the 5.5 per-cent-thick wing structure: the root fittings of the front and rear spars of the port wing. The machined forgings carry the spar-boom loads into unusual spigot-type attachments. The bracket on the rear spars is for the undercarriage radius-rod. Note that steel-tube jigging is employed.





(Left) A wing skin panel. The lipped L-section stiffeners run spanwise and the holes are for attachment to the rib flanges, which run fore-and-aft, not chordwise. (Right) The rear fuselage-frame assembly. The jet-pipe of the Atar is slung by a swinging link just below the fin attachment. Air-brakes fit flush into recesses in the rear fuselage. The tail bullet is a typical Atar (née B.M.W.) feature and is used to adjust the exit area for cruising economy. The extension of the bullet is the outlet for the bearing-cooling air.



(Left) Brake-parachute stowage. The two locking bolts suggest that the fairing is jettisoned on release. The parachute attachment/jettison hook can just be seen at the bottom of the casing. (Right) Close-up of the variable-incidence trim plane. Pivoted near mid-chord, it is actuated by an electric screw-jack.

THE GALTIER DELTA FAMILY . . .

advantage is that, as the centre of pressure moves aft at the speed of sound, so the nose plane can be used to lift the nose instead of depress the tail—thereby adding, instead of subtracting, lift at a critical time when there is a loss of C_L. Furthermore, at low speeds there is no danger of a nose plane being blanketed by the wing.

The proportions of the Griffon's fuselage and jet orifice suggest that the afterburner is a major item in the powerplant complex—perhaps more in the nature of a "turbo-ramjet." Although the engine-duct centre-line coincides with the wing chord line it is probably a clean-run circular duct, with the wing loads carried round the fuselage by banjo frames as in the earlier aircraft. The main body probably contains most of the fuel, as well as the engine duct. The undercarriage is very different from that of the Gerfaut, with narrow-track main wheels retracting forward into the fuselage. The fin area of the Griffon is greater and the rudder smaller than those of its predecessor. J. H. S.

Gerfaut Principal Data*

Powerplant	SNECMA Atar 101D
Sea-level static thrust	2,800 kg (6,173 lb)
Fuel capacity	850 litres (187 gal)
Span	7.50 m (24.60ft)
Length	9.90 m (32.48ft)
Height	4.10 m (13.45ft)
Elevator span (each)	1.68 m (5.51ft)
Aileron span	0.85 m (2.79ft)
Wing area, gross	26.2 sq m (282 sq ft)
Aspect ratio	2.16
Leading-edge sweep	57 deg 20 min
Thickness/chord ratio	5.5 per cent
Fin sweep (leading edge)	55 deg
Trim-plane span	1.85 m (6.07ft)
Trim-plane chord at c.l.	2.15 m (7.05ft)
Track	4.65 m (15.25ft)
Wheelbase	3.73 m (12.23ft)
Empty weight	3,900 kg (8,600 lb)
Gross weight	4,750 kg (10,470 lb)
Maximum level speed	Mach 1.05

* Figures for aircraft with large wing.

SMALL FRY: A DIMINUTIVE CALIFORNIAN TRIO

THE three wee lightweights depicted here were designed and built by Mr. Raymond Stits of Riverside, California. Top left, its length rather less than the fuselage diameter of the background Douglas, is the Sky Baby, powered by a Continental C-85 engine modified to racing standard. Span of the Sky Baby is 7ft 2in, and cruising and top speeds of 165 and 185 m.p.h. are claimed. Wing loading at the gross weight of 668 lb is 18.3 lb/sq ft, total wing-area being 36.5 sq ft. Construction is of fabric-covered metal tube (fuselage) and fabric-covered spruce (wings). Slots are incorporated on both upper and lower planes, with flaps fitted to the upper planes only. Reported landing speed of the Sky Baby is 57 m.p.h. A similarly diminutive companion to the Sky Baby is the Stits Junior monoplane (above). Larger by comparison yet still in the lightweight class is the Stits Playboy, seen with its designer and the Sky Baby in the photograph on the left, taken at West Riverside Airport.

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de Havilland aircraft, de Havilland Gipsy Queen 30 engines (250 b.h.p.)., de Havilland constant-speed propellers (feathering or non-feathering).

A new picture of a Chance Vought F8U-1 Crusader carrier-borne fighter of the U.S. Navy. A news item concerning the type appears on this page.

AIRCRAFT INTELLIGENCE

U.S.A.

McDonnell F-101 Voodoo. Thirty-one test and pre-production Voodoo fighters have been completed by McDonnell Aircraft, and the first production machine is expected to leave the line in June.

Temco 51. This single-jet primary trainer, a competitor of the Beech 73, is claimed to be about 50 m.p.h. faster (i.e., about 345 m.p.h.) though similarly powered with the Continental YJ69-T-9 turbojet of 920 lb thrust. The design is characterized by an astonishingly slender rear fuselage, or tail boom, by small lateral air intakes, and a mid-mounted wing.

Boeing YC-97J. One of these four-engined turboprop transports has returned to Kelly Air Force Base, Texas, after an 18,000-mile round trip to Tokyo, marking the first Pacific crossing by an American-built turboprop aircraft. The 2,500-mile trip from Tokyo to Midway was made at a height of about 30,000ft and at a ground speed of nearly 400 m.p.h.

Chance Vought F8U-1 Crusader. A 45-million dollar U.S. Navy contract for additional Crusader carrier-borne fighters has been received by Chance Vought Aircraft, Inc. This follows an initial order totalling about $100 million announced last December.

France

S.E. Aquilon. Fifty of these two-seat carrier-borne all-weather fighters (developed from the D.H. Sea Venom) have now been delivered, so completing the first and second orders placed with S.N.C.A.S.E. on behalf of the French Navy. The third batch is now coming forward and will consist of an additional forty machines—all single-seaters.

Bréguet Vultur. The Bréguet 960-01, first prototype of the Vultur, has been fitted by Hispano-Suiza with a boundary-layer control system. The machine is now flying at Toulouse.

Marcel Dassault Prototypes. At the Marcel Dassault St. Cloud works the first M.D.550 delta-winged fighter, now called the Mirage, is being fitted with its rocket engine, and the second prototype is being completed. Three other prototypes of a new design are now under construction. The first is the M.D.26, powered by one Orpheus turbojet and built to the NATO light ground attack specification; the second is the Mystère 22 intercepter and tactical support aircraft (Turboméca Gabizos) built to a French Air Force specification; and the third is the Mystère 24, which is a private venture of Marcel Dassault. The Mystère 24 is identical to the two types previously mentioned except that it is powered by a S.N.E.C.M.A. Atar turbojet of 7,700 lb. All three machines have very low all-up weights. The airframes are identical, with 45-deg wing sweep, 6 per cent thickness/chord ratio, and 2 deg 30 min anhedral angle.

Nord 2502. The first of two Nord 2502 Noratlas transports, equipped with wing-tip-mounted Turboméca Marboré booster turbojets, has now logged more than 2,000 flying hours on U.A.T.'s Central African routes. The crews are said to express their entire satisfaction with the handling of the aircraft.

Chile

Indigenous Light Aircraft. Chilean radio reported a few days ago that the Chilean Minister of Public Works and the vice-chairman of the National airline, Don Adalberto Fernandez, piloted the first aircraft ever built in Chile—by the Fanaero works. The flight was made from Cerrillos airfield. The machine is described as being light and suitable for touring and light cargo work.

MAX HOLSTE M.H.1521 BROUSSARD
(Pratt and Whitney R-985 Wasp Junior)

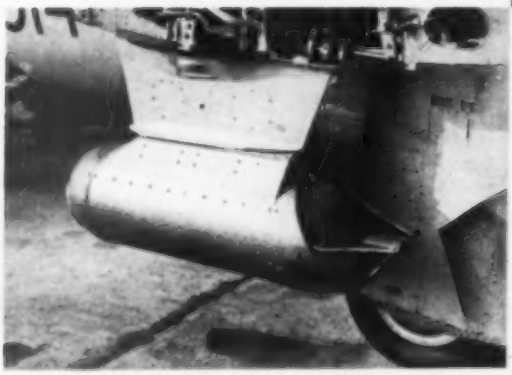
Span 45ft
Length 28ft 2in

THE FLEET AIR ARM TRIALS UNIT

Evaluating Aircraft and Equipment

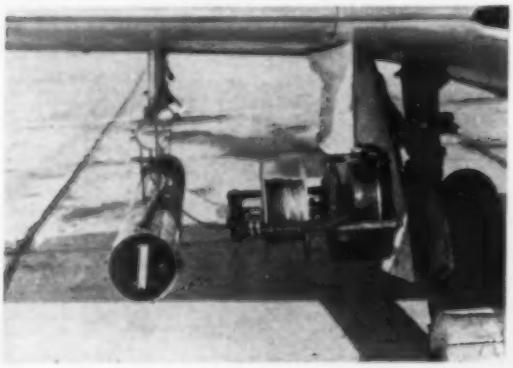
By A. CECIL HAMPSHIRE

A Westland Wyvern hooks-on during T.R.U. deck-landing trials.



Drogue container under trial on a Sea Hawk's bomb pylon.

The Excelsior banner-streaming unit mounted on a Sea Hawk.



LAST but by no means least in the test programme of every new Naval operational aircraft are the Service evaluation trials. They are one of the main reasons for the existence of No. 700 Squadron, otherwise known as the Fleet Air Arm Trials and Requirements Unit.

But (as Lt-Cdr. R. W. Turral, the unit's present commanding officer, hastens to point out) No. 700's pilots are not test pilots in the popular sense of the term. The squadron comprises a representative group of Fleet Air Arm officers whose job is to try out new aircraft under operational conditions and see how they stand up to Service use. The main personal qualification needed is good or above average—but not exceptional—flying ability, coupled with as wide experience as possible.

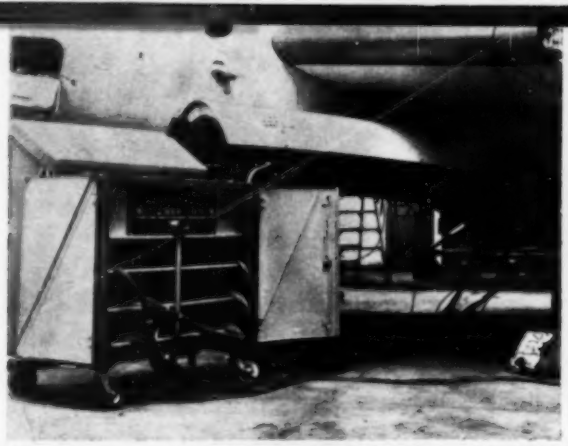
The trials programmes are based on a stringent interpretation of the rôle of each new aircraft coming into the Fleet Air Arm, and the aim is to supply commanders of new squadrons, as they form, with a comprehensive report on the machines they will be flying.

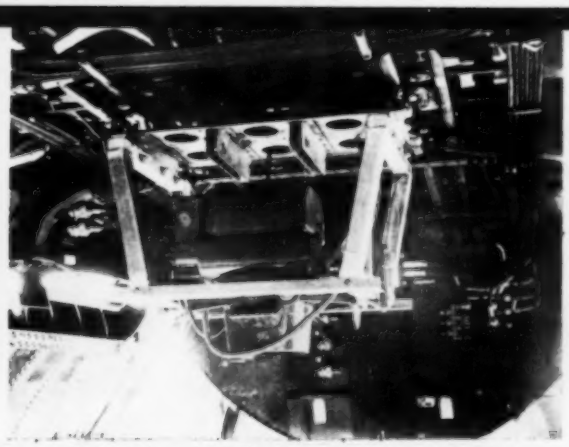
The unit, which is practically self-contained (except as regards spares, for it holds widely varied types of aircraft) is based at R.N. Air Station, Ford, Sussex (H.M.S. *Peregrine*). Station resources can be called on when necessary, and for spares the T.R.U. ranks immediately after the first-line squadrons.

Although a Trials Unit has existed since 1946, No. 700 Squadron as at present constituted came into being only in August of last year—through the amalgamation, for economy reasons, of the old Service Trials Unit (at that time No. 703 Sqn.) and the former Fleet Requirements Unit (then No. 771 Sqn.). In January of this year the Naval Air Fighting Development Unit was added.

The combined establishment of the new T.R.U. now comprises three Fairey Gannet A.S. Mk 1s, four Hawker Sea Hawks, two Westland Wyverns, two de Havilland Sea Venoms, three de Havilland Sea Vampires, eight Fairey Firefly 4s, and two Avro Ansons for photographic work. If certain camera trials with the Gannet now going forward are successful the Ansons will probably be dispensed with.

The personnel of the unit totals some 200 officers and ratings, and includes 14 pilots, two observers, three engineer officers and two electrical officers. Average age of the pilots is 26. Ford's station photographic officer flies with the unit on all photographic trials. Officers and men serve from 18 months to two





(Opposite page, top) Some of No. 700's varied types outside a 1917 hangar at Ford. (Above, left) The Gannet armament electrical test rig (rear view) being subjected to a T.R.U. evaluation. (Right) F.24 camera mounted in the bomb bay of the Fairey Gannet A.S.Mk 1.

years in the squadron, and thus there is a constant but not unwelcome movement of personnel, providing a continual influx of new blood and fresh viewpoints.

The rôle of the newly constituted T.R.U. is today very comprehensive and covers more than merely trying out new arrivals. As ordered by the Admiralty (Director of Air Warfare and Director of Air Organization and Training) through the Flag Officer Air (Home) the squadron is required to investigate and report on all tactical flying of new aircraft other than anti-submarine, and to investigate new tactical methods put forward, e.g., interception techniques. The unit also carries out intensive deck-landing trials of all new aircraft and of aircraft fitted with new equipment. Carrier trials cover such requirements as proving arrester gear and modifications thereto, and catapults in new aircraft-carriers and in carriers emerging from refit.

The programme of the Service trials carried out on the Fairey Gannet last year by the now-assimilated 703 Sqn. provides a fair example of the job of the T.R.U. A special flight was formed to evaluate the Gannet's general suitability for its rôle and to assess its mechanical and structural reliability. Aircrew were given full opportunity to criticize the machine's flying qualities, equipment and instruments under operational conditions. Similarly, ground crews were required to keep continuous record of the life of every part. Four Gannets were used, each being given a minimum of 25 flying hours per week. The total flying time scheduled for each aircraft was some 200 hours.

Twenty-five sorties, using all four aircraft, were made on maximum-endurance search, with targets to be found; full search and communication equipment, including V.H.F. relay, was employed. Five sorties per aircraft, used singly or in pairs and operating near sea level, were made to test ease of handling and the effects of pilot fatigue. Another five sorties per aircraft, singly or in groups, were made against a target which had to be located at night. Fifteen sorties per aircraft, on two aircraft operating singly, were made, during which several dummy attacks with high-g conditions were executed. Twenty sorties on each aircraft followed, during which eight dummy deck landings had to be made, the last few being controlled heavy landings.

In order that pilots might test the windscreen-wiper installation and comment on the view from the cockpit as many sorties as possible were made in rainy conditions. Ten flights by single aircraft to drop sonobuoys and other stores were made to check ability to fly accurately for stores-dropping. Lastly, several sorties were flown to investigate range, using varied conditions of "single" and "double" powers from the Armstrong Siddeley Double Mamba engine. When single-engine flying was carried out engines were run alternately for half-hour periods and the ease of relighting noted. On all occasions when four aircraft were airborne together formation flying was practised to test ability to keep formation in various configurations.

Carrier arrester-gear trials, both in new ships and in vessels after refit, call for a series of landings to check the pull-out of wires by aircraft at standard deck-landing weight under conditions of maximum down to minimum wind speeds. Maximum is about 50 kt over the deck. It is seldom that the wires break, but occasionally a hook pulls out.

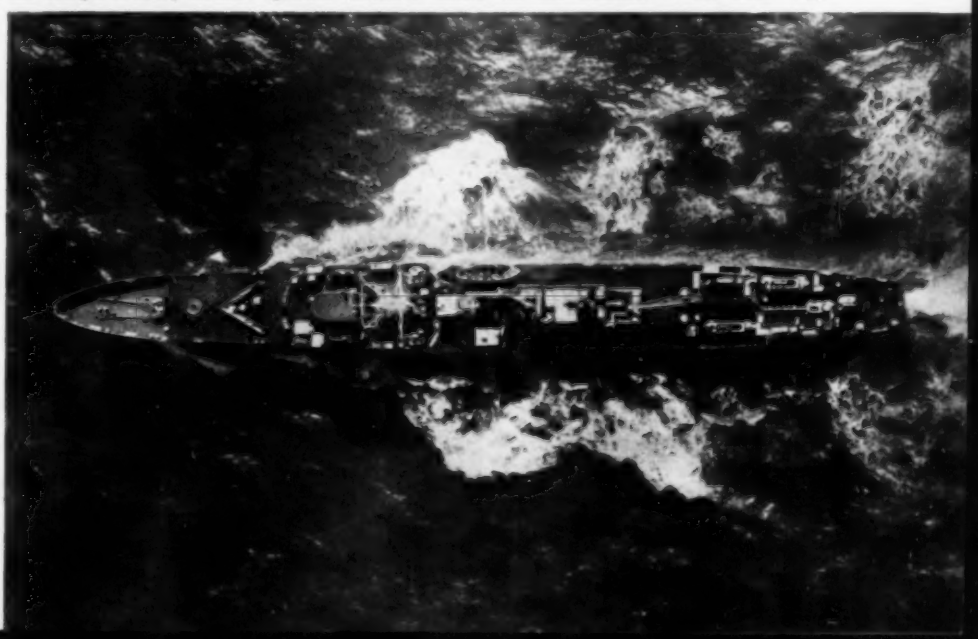
The T.R.U. are the first to use new catapults as they are installed in carriers. The catapults are tried out with light dummy shots at first, then up to the tested load. Finally the T.R.U. aircraft is itself catapulted. The minimum number of such trials is twelve per aircraft. Gannets, Venoms, Sea Hawks and Wyverns are all used in carrier trials.

In 1950, when the development of the steam catapult was sufficiently advanced for testing, Lt-Cdr. J. M. Glaser, then C.O. of the Service Trials Squadron, flew-off the first piloted aircraft, a Firefly, by this means. He followed this with the first jet, a Vickers-Supermarine Attacker. Other pilots of the squadron took part in the trials, and later went to America in the carrier *Perseus* to demonstrate the new catapult to the U.S. Navy.

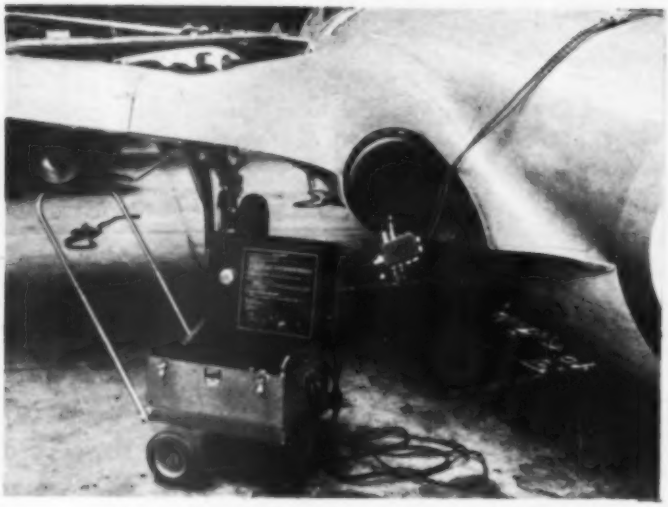
The future programme of the unit will include trials of the light fleet carrier *Warrior*, now undergoing modernization to include fitting the angled deck, and they will also do the flying trials for *Bonaventure*, the new carrier nearing completion for the Royal Canadian Navy.

Much of the work of the T.R.U. is also concerned with trying out new landing aids such as the angled deck, mirror landing device, and the "Audio" A.S.I. The last-named is now being tried out in the unit's Wyverns. When such a trial is ordered Lt-Cdr. Turral selects a co-ordinator from the squadron to take charge of the project. Brief details of the equipment or apparatus to be tested, the name of the co-ordinator, priority of the trial, and the aircraft allocated are then entered up on the trials board. Priorities are noted as A*, A, B, and C according to importance or urgency.

A meeting is then called of the co-ordinator, the senior air engineer and electrical officers, and all appropriate tradesmen of chief petty officer or petty officer rating who will be concerned. The C.O. of the unit presides. The project is explained and a general directive issued on the conduct of the trial. The



This photograph of the frigate H.M.S. "Hardy" was taken with the F.24 camera fitted in a Gannet.



Jetcal thermocouple tester in use on a Sea Hawk.

THE FLEET AIR ARM TRIALS UNIT . . .

co-ordinator then gets on with the job and supplies weekly reports on progress. Full records are kept throughout the trial of all action taken. Periodically the data are analysed and policy determined on any further stages required, or a directive issued for the final report to be drawn up. The reports, brief and to the point, are under the standard headings of Authorization, Object, Description of Equipment, Conduct of the Trial, and Conclusions.

When the writer visited the unit recently only a comparatively modest programme was scheduled on the Trials Board. No new aircraft is due to come along until the Vickers-Supermarine N.113 FSGA (fighter strike/ground attack), and the de Havilland D.H. 110 enter service. Nevertheless, a selection of some of the miscellaneous equipment items affords a glimpse of the typical daily chores of the T.R.U.

Near ng completion are trials of an air-to-air target device known as the Excelsior banner-streaming unit. The brainchild of No. 802 Sea Hawk Squadron, now serving in *Eagle*, it consists of a banner target made of nylon which can be streamed at a controlled speed by the towing aircraft. Rolled up like a window blind, the banner is stowed in a metal tube secured to the starboard R.P. rail of a Sea Hawk. The towing wire on its drum, together with a Lanchester fluid flywheel which controls the speed of paying out, are slung in a cage on the starboard bomb pylon. When ready to stream the target the pilot presses the firing button, and this releases the banner from the tube. As it streams the cable pays out at a speed governed by the fluid flywheel, which revolves at 500 r.p.m. Length of tow is 1,000ft, and the cable can take a strain of 15 cwt. The banner must be released before landing, and this is done by actuating the nose fusing switch of the bomb installation.

The rolled banner of the Excelsior banner streaming unit for air-to air firing, rolled up ready for packing into the stowage tube.

Another target device under trial is a drogue container developed by the Ministry of Supply for streaming the drogue in the air instead of towing it off the deck. This is a light metal, tank-shaped container slung on the bomb pylon of a Sea Hawk, inside which the drogue is stowed together with its specially coiled nylon rope.

An item of ground equipment being tried out in the unit is a portable, self-contained armament electrical test rig. Developed for use with the Gannet, the rig enables all circuits to be simultaneously plugged in and tested. The verdict on this is generally favourable.

Smaller items on the menu include trials of a new method of binding R.P. "pigtails" by the use of an adhesive strip called "Rippatape"; and also a rain repellent developed for use on windscreens. A minor but useful addition to the cockpit equipment of the Firefly tried out and approved by the T.R.U. was a rear-view mirror for target towing.

An interesting item on the current T.R.U. trials schedule is a tryout of the "windmill start" for airscrew-driven aircraft. The idea is to start a second machine from the slipstream of another placed directly ahead. Such a method would presumably be useful in an emergency with only a limited number of starter cartridges available. Trials have so far proved that a Gannet can be started up by ground windmilling, but the method was unsuccessful with a Firefly placed either directly in the slipstream or at an angle of 45 deg to the Gannet. The reason for this may be that the nose of the Firefly is too high, whereas the Gannet stands practically level on its nose undercarriage.

Photographic trials and tests of new cameras form another of the tasks of the T.R.U., and the unit is required to photograph all new and refitted warships for Admiralty files. The present programme includes the investigation of a method of overcoming the tendency of cameras in Sea Hawks to mist-over when the aircraft are diving. Also working out successfully, as stated earlier, is the installation of a vertical camera in the bomb bay of the Gannet with the eventual object of replacing the Anson.

No. 700 Squadron exercises operational control of the Fleet Requirements Unit at Hurn, and the two combine in providing aircraft for the trials of all ships' radio and gunnery equipment. There are no towing aircraft in the fleet, and another of the duties of the T.R.U. is to tow sleeve and wing targets for individual ships and fleet gunnery exercises. Firefly 4s are used for target towing, which, if comparatively unexciting for the unit pilots who have to accompany the Home Fleet on its cruises, at least provides a change of scenery.

So far the T.R.U. lacks a crest. The now-defunct 703 Sqn., formerly the Service Trials Unit, prominently sported a pair of scales in its crest as appropriately indicative of its judicial rôle. The new 700 is now seeking an equally apt heraldic combination of the multifarious tasks which come under the twin headings of "trials" and "requirements."

PROJECT VANGUARD

THE U.S. Navy and the Martin Company recently released some details of the three-stage rocket vehicle which is being designed to set the world satellite—project Vanguard—in its orbit next year. In appearance, the vehicle resembles an attenuated rifle bullet and cartridge, the larger diameter of the latter being the first stage. Some 45ft in length, this will be the first liquid-fuel rocket to be designed for control without the use of fins. The second-stage rocket, mounted above the first, also uses liquid propellants, and the third-stage rocket is completely enclosed within it. This third-stage vehicle, which in turn carries the small satellite within its nose, is a simple rocket of the solid-propellant type.

The first stage, which launches the entire assembly, will burn out at an altitude of between 30 and 40 miles and will then separate and drop off. The second stage will then take over, and "at a certain time" will jettison its nose-cone, leaving the third stage and the satellite exposed The second stage will now begin to tilt in the direction of the satellite's predetermined flight-path; and after its burn-out, it will continue to coast upward until it attains the satellite's intended orbital altitude.

At that point a spinning movement will be imparted to the third-stage rocket to ensure directional stability. By that time the third stage will be set on its course, the second stage will drop off, and the third stage will start firing. Its purpose is to boost the satellite's speed to approximately 18,000 m.p.h. This high speed, necessary to counteract the earth's gravitational pull, will be attained at burn-out.

At burn-out, say Martin, "the satellite may be nudged ahead by means of a releasing device in the nose of the rocket." Therefore its speed will be slightly greater than that of the rocket shell, which will not drop to the earth, but will trail the satellite until atmospheric drag causes it gradually to slow down.

General Electric have a contract for the first-stage rocket and Aerojet-General for the second stage.

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OUT and DOWN

THOUGH no still photograph could reproduce the sensations of parachute jumping, these five pictures of troops under training do convey something of the tense yet disciplined atmosphere of a typical exercise. In the first view, above, an R.A.F. sergeant checks an officer's harness release; in the second picture the troops are entering a Transport Command Hastings, the interior of which makes the third photograph: each trainee is connecting-up to his static line linked to the cable overhead. Last are two views of actual drops. In both, the man is wearing an equipment pack; this falls clear of the wearer's leg when his parachute opens, but remains suspended by its own line.

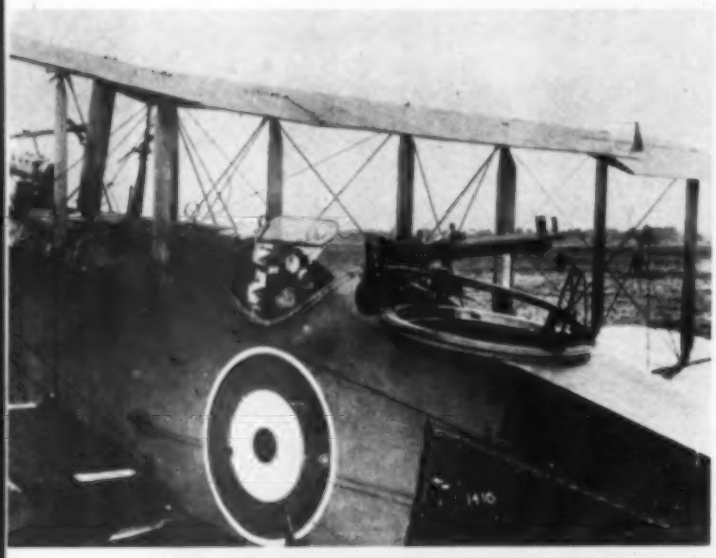
THE DE HAVILLAND D.H.9

HISTORIC MILITARY AIRCRAFT No. 12

Part II

By J. M. BRUCE, M.A.

The first of the three views below shows the pilot's and observer's cockpits of a D.H.9. Note how the pilot's Vickers gun was recessed and fired through a trough. The observer had a Lewis gun. The second picture is of a Hythe camera gun on the Scarff mounting of a D.H.9, and the third depicts a "Nine" with a prototype Napier Lion engine.



OUTSIDE the Independent Force, the D.H.9 continued to be used for tactical bombing. In the early stages of the great Amiens offensive of August 1918 the bridges across the Somme provided targets for the D.H.9 squadrons. On August 8th, No. 107 Sqn. participated in the attack on the bridge at Brie; the road and railway bridges at Péronne were bombed by No. 98 Sqn.; the bridge at Bethencourt was attacked by No. 49 Sqn.; and the D.H.4s and D.H.9s of No. 27 Sqn. bombed the bridges at Voyennes, Pithon and Offoy. More attacks were made on the following day, and seven D.H.9s of No. 49 Sqn. acquitted themselves gallantly when attacked by 20 German fighters: although prevented from bombing their target (the bridge at Falvy), they fought their way home without loss, and shot down one of the enemy in flames.

An eloquent commentary on the D.H.9's performance as an operational aircraft appears in these words in Vol. VI of *The War in the Air* (page 454):—

"In the four days of intensive fighting, from the 8th to the 11th of August inclusive, the D.H.4s of No. 205 Squadron were in the air for a total of 324 hours 13 minutes, and dropped 16 tons of bombs. Every aeroplane returned from its mission, and no more than one had to be struck off the strength of the squadron. This aeroplane, which had been hit in combat, was too badly damaged to be reconstructed in the squadron and had to be sent to the depot. By way of comparison, a typical D.H.9 squadron flew a total of 115 hours in the same period and dropped four and a half tons of bombs. During the operations seven of the D.H.9s were lost and two others were wrecked, and ten pilots had to leave formation, without dropping their bombs, through engine trouble. A further sidelight on the engine question is in the fact that in the same four days pilots of No. 205 Squadron required no more than a total of 3½ hours in all on test flights while those of the D.H.9 squadron spent 21 hours in the air on similar duties."

It should not be forgotten that some squadrons were compelled to exchange their D.H.4s for the inferior D.H.9s.

Engine trouble was inseparable from the D.H.9. On August 25th, 1918, 13 D.H.9s of No. 98 Sqn. and 11 of No. 107 set out to bomb the enemy aerodrome at Mont d'Origny. Five of No. 98's machines and three of No. 107's had to turn back with engine trouble. On October 1st, of 29 D.H.9s which took off on a second attempt to bomb the railway junction at Aulnoye, no fewer than 15 were compelled to return with faulty engines.

To the end, the D.H.9 lacked the performance necessary to do its job. The unreliability of its engine was not improved by sketchy maintenance in the hectic days of the Allied advance, and the aircraft could seldom climb higher than 13,000ft. At that height it was subject to energetic fighter attacks, and it was not uncommon for whole formations to have to jettison their bombs well short of the target if large numbers of defending fighters appeared. The official historian remarked (*The War in the Air*, Vol. VI, page 547):—

"In summing up it is probably fair to say that to a great extent the energy expended by the D.H.9 squadrons was wasted. Bombs dropped at haphazard, when definite targets are being sought at a vital time, cannot be reckoned of much military account."

It was inevitable that an aircraft built on such a large scale should be used in other theatres of war. In Palestine, No. 144 Sqn. was fully equipped with D.H.9s by the end of August 1918. The squadron bombed Der'a railway junction on September 16th and 17th, and made two attacks on the telephone exchange at El'Affule on the 19th. As part of the intensive harassing of the retreating Turks, the D.H.9s of No. 144 Sqn. bombed and gunned the enemy forces on the Tul Karm-Nablus road on September 19th, in the Wadi el Far'a on September 21st, and on the Es Salt-'Amman road on September 23rd.

The D.H.9s which served with squadrons Nos. 17 and 47 in Macedonia were used more as reconnaissance aircraft than as bombers. Some flights of 300 miles were made, and places as remote as Kyustendil and Radomir were photographed. "A" Flight of No. 47 Sqn. was completely equipped with D.H.9s by August 21st, 1918, and No. 17 received a flight during the next month: both units had six D.H.9s at the time of the Armistice. On September 21st, these D.H.9s were employed in their true capacity when they bombed the Bulgarian army in the Kosturino Pass.

Some D.H.9s went to the R.A.F. units operating from the islands in the Aegean. With a cool disregard for the unreliability of the Puma, the aircraft were used in several attempts to bomb Constantinople. The 440-mile flight demanded an endurance

of 5½ hr, and the D.H.9s were fitted with "home-made" tanks which gave an endurance of 5¼ hr. The reserve of fuel was so small that several pilots were forced down on the sea just short of their island base.

On October 2nd, 1918, British and Italian warships attacked the Albanian port of Durazzo and, as part of the operation, the D.H.9s of No. 226 Sqn. bombed the town, having flown across the Adriatic from Taranto.

The D.H.9 was to have been used by the R.N.A.S. from stations in the United Kingdom, and the initial allotment, made in March 1918, was a total of 56 machines. Of these, 24 were to have been supplied by Westlands, 12 by Mann, Egerton and Co., and 20 by Short Brothers. A few D.H.9s were in fact issued to coastal stations in the United Kingdom in the summer of 1918; they were used for oversea patrols and, occasionally, as escorts for the F.2A and F.3 flying-boats. One such D.H.9 from Great Yarmouth, manned by Capt. B. G. Jardine and Lt. E. R. Munday, is believed to have damaged the Zeppelin L.65 on August 5th, 1918. The D.H.9 never returned to its base: Lt. Munday's body was picked up at sea by a minesweeper a few days later, but no trace of Capt. Jardine or the aircraft was ever found. It has been surmised that Jardine may have mistaken burning petrol from the L.70 (which had been shot down by Cadbury and Leckie) for landing flares and come down on the water. It seems equally probable that Jardine and Munday may have been but two more victims of the Siddeley Puma's chronic unreliability.

One of the unexplained mysteries of the First World War is why more D.H.9s were not fitted with the 250 h.p. Fiat A-12 engine. At the end of August 1917, just when the Puma's faults had begun to manifest themselves, 2,000 Fiat engines were ordered in Paris on the initiative of Sir William Weir. The terms of the contract required delivery between January and June of 1918; half of the engines were to go to America, and the other 1,000 were expressly intended for installation in D.H.9s. Official statistics show that 253 Fiats were delivered in the last quarter of 1917, 58 in the first quarter of 1918, none in the second quarter, and 299 in the third quarter; a total of only 610. (It must also be remembered that that total may include the Fiat engines intended for the 50 D.H.4s ordered by Russia in 1917 but diverted to the R.F.C.)

The precise number of D.H.9s which had the Fiat is uncertain. Installations of the engine were made in C.6052 and D.5748; and Contract No. A.S.34886, dated November 19th, 1917, was the only D.H.9 contract to specify the Fiat. It was for only 100 aircraft (D.2776-D.2875) which were ordered from Short Brothers. Official test reports on a Fiat-powered D.H.9 are dated January and February 1918.

Like the B.H.P. and Puma, the 250 h.p. Fiat was a six-cylinder, in-line water-cooled engine. Its installation in the D.H.9 was therefore very similar to that of the standard power unit: its chief distinguishing feature was its exhaust manifold's location on the starboard side; that of the B.H.P. and Puma was on the port. On D.5748 at least, the radiator appeared to be non-retractable, for it was furnished with shutters.

Writing of the Fiat-powered D.H.9 in *The Clouds Remember*, Oliver Stewart said that the Italian engine ". . . emphasized still further the comfort characteristics of the D.H.9, for it was a sweet-running engine."

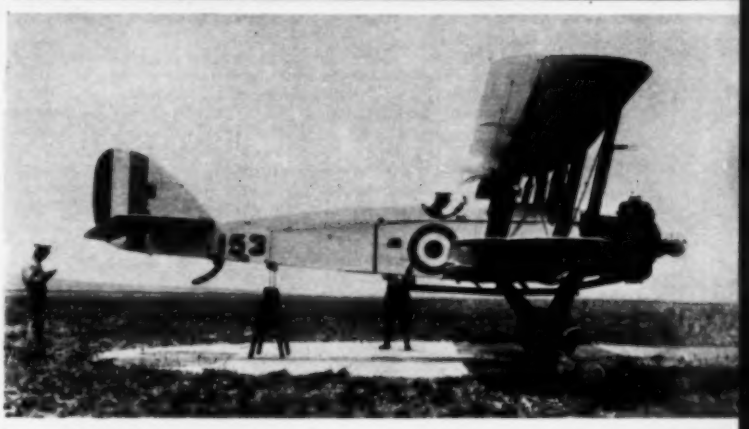
Development of the Siddeley Puma continued, and by the late summer of 1918 a few modified engines were available which had a higher compression-ratio and delivered 290 h.p. A D.H.9 fitted with a high-compression Puma was tested in October 1918, but the more powerful engine made no appreciable difference to the aircraft's performance.

In 1918 the D.H.9 numbered C.6078 became the first aeroplane to be fitted with a new British engine which was to give years of excellent service in many types of aircraft. Design of this power unit had begun in the summer of 1917: it was designed by Mr. A. J. Rowledge and was built by D. Napier and Son, Ltd., who were contractors for the R.A.F.3A engine, a liquid-cooled vee-twelve with a nominal output of 200 h.p.,and for the Sunbeam Arab.

The new Napier engine was also a liquid-cooled twelve-cylinder unit, but its cylinders were disposed in three groups of four, the groups being arranged in a broad-arrow configuration. The Napier engine combined the individual cylinders and sheet-metal water jackets of the old school of design with the monobloc cylinder head of the up-to-date engines. To its makers the new engine was known as the Napier Triple-Four, and in September 1917 it was expected to deliver 300 h.p. at 10,000ft. It was later designated Napier Lion.

Early in 1918 one of the prototype Lions was installed in C.6078 and trials were begun at Farnborough. After early difficulties, particularly with the heating of the induction system, had been overcome, the engine proved itself to be a sound power unit of considerable promise. It was placed in production, and by October 31st, 1918, the R.A.F. had 22 Lions on charge.

The effect of the Lion on the performance of the D.H.9 was remarkable. In the summer of 1918 the first production Lion, rated at 430 h.p., was fitted to C.6078. With it the aircraft proved to be 30 m.p.h. faster than the standard Puma-Nine, and its rate of climb was trebled. The D.H.9's airframe was strengthened by fitting additional three-ply webs to the forward portion of the fuselage and steel plates to cross-members; ash strips reinforced the lower longerons at the tail, the forward spar of the tailplane was strengthened and steel-tube bracing struts were fitted. A larger radiator was used.



The uppermost picture shows a D.H.9 with a production Napier Lion engine. The second and third views are of two versions of the Mpala (a South African D.H.9 development) the first with Jupiter VI engine (direct drive), and the second with Jupiter VIII (geared).

In October 1918 the Lion-Nine went to Martlesham Heath for Service trials. Its excellent performance commended it to the pilots there, and one of them, Capt. Andrew Lang, decided to find out the aircraft's full capabilities. On January 2nd, 1919, accompanied by Lt. Blowes as his observer, Capt. Lang flew the Lion-Nine to an altitude of 30,500ft. The climb took 66 minutes 15 seconds and constituted a new world's altitude record at the time.

Belgium was the only one of our Alljes to use the D.H.9 operationally: 18 machines were supplied in 1918. Had the war lasted longer than it did, however, great numbers of American-built D.H.9s would have been used by the American Expeditionary Force, for production on an enormous scale in America was planned. When the Armistice was signed, eight contracts for a total of 14,000 aircraft were cancelled.

Two British-built D.H.9s had been bought without engines by the American Expeditionary Force in July 1918. One was sent to America, and it was apparently fitted with a 400 h.p. Liberty 12-A engine. It was not the first D.H.9 in America, however, for there are indications that two were there in early June 1918. An official American report records that "The test of the De

THE DE HAVILLAND D.H.9 . . .

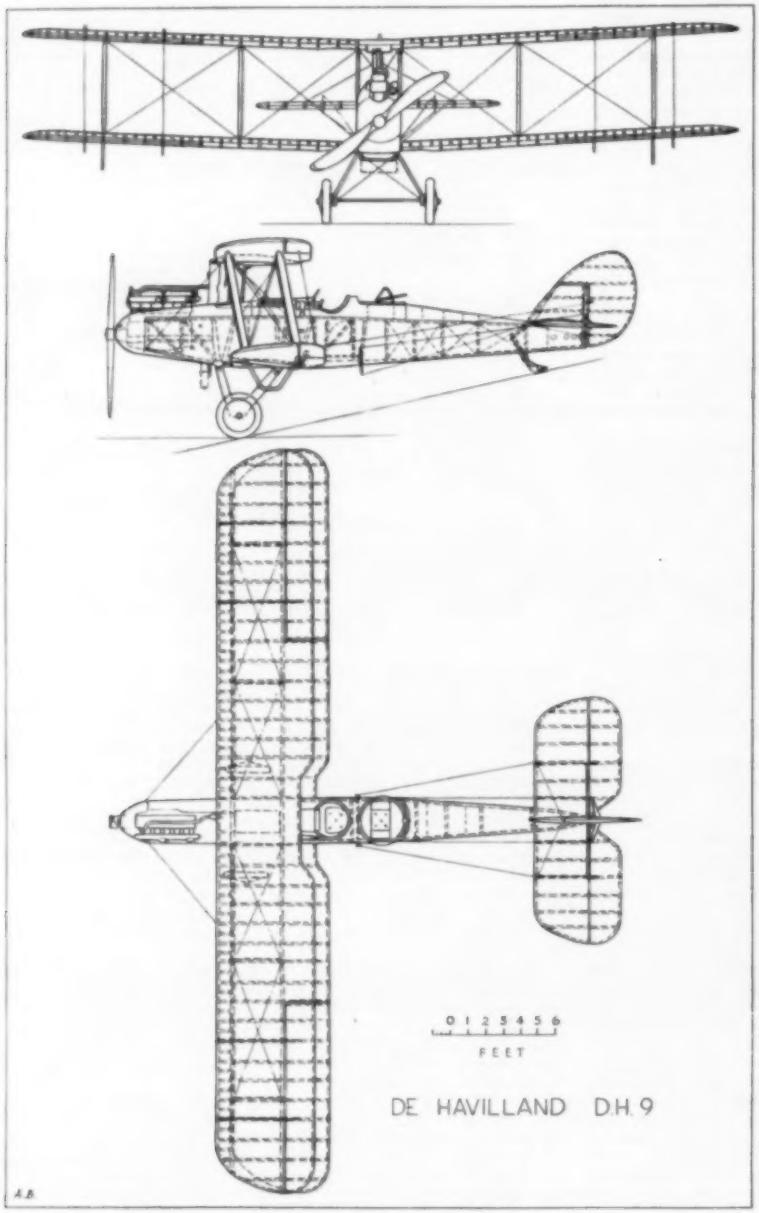
Havilland-9 (*sic*) airplane was brought to a summary conclusion in June 10 when the plane crashed upon leaving the field due to the dying of the engine."

An American development of the D.H.9 was built under the designation USD-9. The drawings for the new type were completed in the first week of June 1918, by which time construction of components had begun. Official reports indicate that the wings were of metal construction with spars of cold rolled steel and ribs of duralumin; the engine was the 400 h.p. Liberty 12. Prototypes were ordered from the Engineering Division of the Bureau of Aircraft Production, the Dayton-Wright Airplane Company, and the Fisher Body Corporation. Four were delivered in August 1918, two from the Engineering Division and two from Dayton-Wright. The Fisher Body contract was cancelled on June 13th at the company's request.

It is uncertain whether the 14,000 aircraft ordered in America were to have been ordinary D.H.9s or USD-9s, but there can be little doubt that they would have been fitted with the Liberty engine. The use of the Liberty was something of an *idée fixe* with the U.S. Government of the day, so much so that in at least one case (that of the Curtiss-built Bristol Fighter) its installation was insisted upon in defiance of technical advice to the contrary. When this completely unsuitable combination of airframe and engine proved to be a failure, American officialdom promptly blamed the Bristol Fighter and condemned the aircraft. Fortunately, the D.H.9 airframe would have been quite well suited to the big American engine. The history of the Liberty engine will be discussed in some detail in the next article in this series, which will deal with the D.H.9A.

The Armistice brought deliverance to the D.H.9 squadrons on the Western Front and in the Mediterranean, but the aircraft's operational career was not over. Squadrons Nos. 47 and 221 were equipped with a mixture of D.H.9s and D.H.9As for service with Denikin's White Army in Russia in 1919. No. 47 Sqn. operated from Ekaterinodar, No. 221 from Petrovsk. So intense was the cold that water had to be boiled and oil heated before radiators and sumps could be filled. The hardships suffered by the crews in their open cockpits can only be imagined.

Perhaps the last warlike act of the R.A.F.'s D.H.9s was their brief 21-days' action in January and February 1920, when 12 aircraft of "Z" Force and a small contingent of the Camel Corps brought about the final defeat of the "Mad Mullah" in Somaliland.



One of the D.H.9s was D.3117, which was modified for casualty evacuation purposes: a single stretcher case could be carried on the upper longerons, enclosed in a large fairing which extended from the rear of the pilot's cockpit to the fin.

While still in R.A.F. service the D.H.9 helped to pioneer air-mail transportation in Europe. In March 1919 a regular air-mail service was initiated by 18 D.H.9s of No. 120 Sqn., which carried mail from Hawkinge to Cologne for the Army of Occupation. The first mail-carrying flight was made on March 1st, 1919, by four of No. 120 Squadron's aircraft, led by Capt. A. F. Hordern. Their destination was Maisoncelle, whence the mails were flown to Cologne by machines of Nos. 18 and 110 Sqns.

A few D.H.9s were still in service early in 1921, and were employed on coastal patrol duties, some of them forming the nucleus from which the Fleet Air Arm grew. These machines formed part of the equipment of the Mobile Squadron for Fleet Co-operation which was based at Leuchars.

The D.H.9 was declared obsolete by the R.A.F. in September 1921, but it continued to serve with the air forces of other nations all over the world. Many were offered to the Commonwealth countries under the Imperial Gift arrangements, but not all were accepted. The type was used by the Royal Australian Air Force, but New Zealand accepted only nine D.H.9s belatedly in 1920. The six which were supplied to Canada included F.1181 and F.1255, but were not part of the Imperial Gift: they were supplied through the Overseas Club and Patriotic League.

The D.H.9 saw long service in South Africa. Of the 100 aircraft presented to the Union as the Imperial Gift, 48 were D.H.9s. One of these machines was H.5648, later named *Voortrekker*, on which Wing Commander H. A. van Ryneveld, D.S.O., M.C. (later Lt-Gen. Sir Pierre van Ryneveld), and F/L. C. J. Q. Brand, D.S.O., M.C., D.F.C. (later A.V-M. Sir Quintin Brand), arrived at Cape Town on March 20th, 1920, having flown from Brooklands. This first flight from England to Cape Town had been mostly accomplished in two Vickers Vimys, and the D.H.9 was used only to fly from Bulawayo to Cape Town.

The South African D.H.9s were long-lived, and in the course of their service they pioneered air-mail flying in the Union. After a proving flight on February 23rd, 1925, the machines numbered 113 and 127 inaugurated the air-mail service between Cape Town and Durban on March 2nd.

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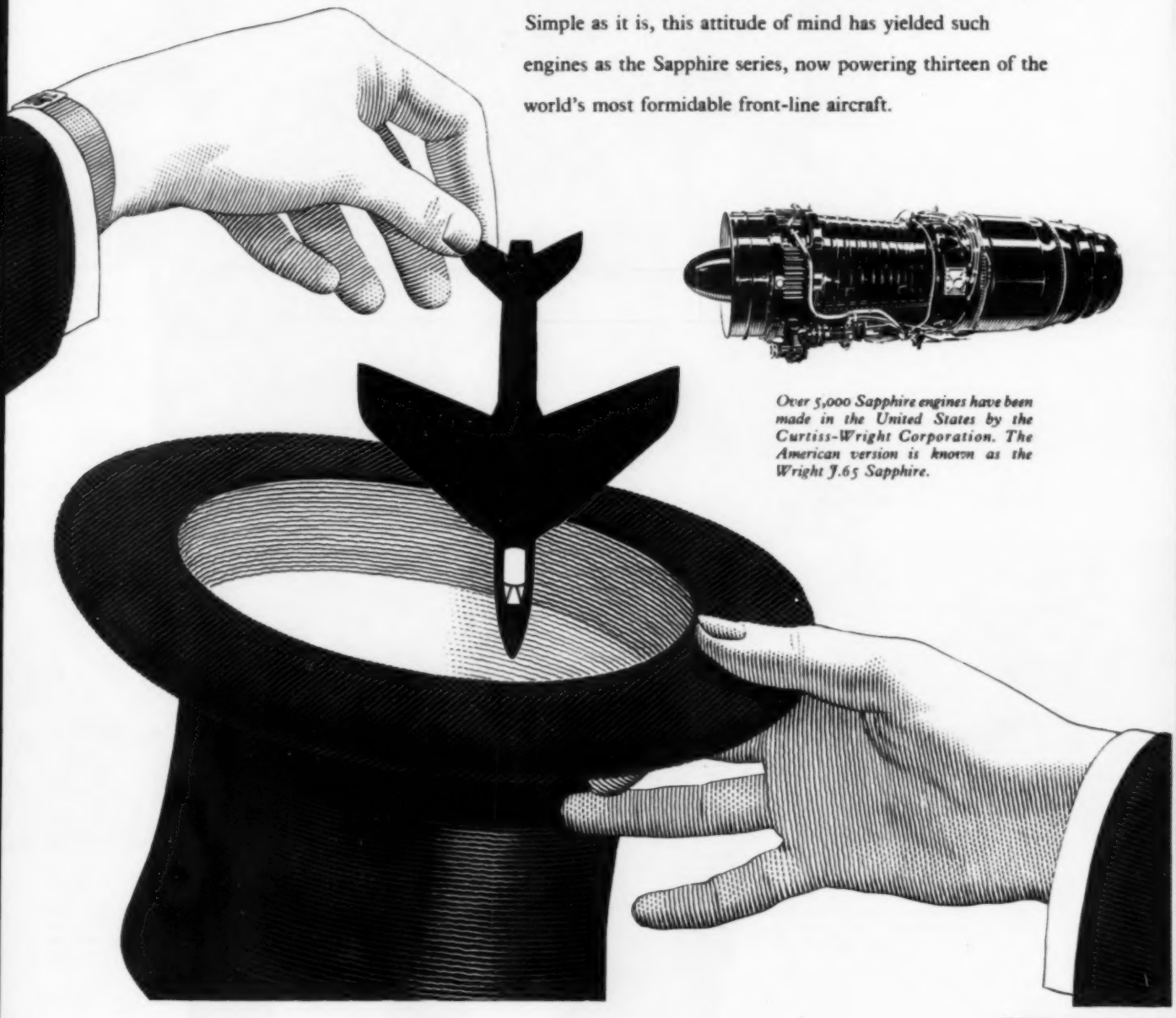
We do not believe in short cuts. There is no magic in our method, no mystery in our formula for progress in the air. To meet a set of known requirements we design an aircraft engine. Then, meticulously and with constant re-examination of our thinking and its results, we test it. When, and only when, its practicability is proven beyond doubt, we extend its performance and scope by continuous, painstaking development. Simple as it is, this attitude of mind has yielded such engines as the Sapphire series, now powering thirteen of the world's most formidable front-line aircraft.

Over 5,000 Sapphire engines have been made in the United States by the Curtiss-Wright Corporation. The American version is known as the Wright J.65 Sapphire.



ARMSTRONG SIDDELEY AERO ENGINES

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Their thoughts in the sky.
Their feet on the ground.
Aircrew blend courage with careful skill.

Future perfect...

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There is excitement, exhilaration, in the lift and thrust of jet flying. There is also a deep and lasting satisfaction, known only to those who fly. Ask these men to describe it and words fail. Ask them to do without it and they worry. Once you have shared the tranquillity of that new world above the clouds, you cannot easily forgo it.
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Present Action—Future Perfect

These men can realise their dream. They have within their grasp the opportunity of a lifetime of exciting and satisfying work. With the R.A.F., pilots, navigators and air electronics officers fly often. They fly far afield. And they manage some of the finest machines in the world: Canberra, Valiant, Hunter—these names are but the prelude. "But there's more to a life than flying" you may say. The Royal Air Force knows this and has planned accordingly.

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The new higher basic rates and extra flying pay now give aircrew incomes that compare very favourably with most other professions. For instance, a newly promoted Flight Lieutenant drawing full allowances now earns nearly £1,500 a year and this can rise with seniority to nearly £1,750.

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Aircrew do much more than fly. They are often seconded for important work in Britain and abroad. Training others, international liaison, scientific exploration—these are but a few of the diverse and important missions to come the way of aircrew personnel. And the new Direct Commission scheme provides the opportunity to make the Royal Air Force a career. You can join, as an officer, with the certainty of a continuing and satisfying job until you retire with a pension. Or you can choose, if you wish, a twelve-year commission, with the option of returning to civilian life after eight years. In this case you return with a handsome tax-free gratuity, far more than you are likely to save in a similar time in any other profession.

How to fly with the R.A.F.

Because their opportunities are great and their work important, standard of entry for aircrew is very high. Education to at least the level of the General Certificate of Education, Scottish Leaving Certificate or their equivalents, perfect physical health, aptitude as well as enthusiasm for flying—to these must be added the ability and personality to lead others. You must also be between 17½ and 26. If you have these qualifications, you have the chance of a career that is both rewarding and worthwhile. Write at once for further details of the schemes of entry, and for an interesting, informative booklet on flying with the R.A.F., to the Air Ministry (F.R. 302c), Adastral House, London W.C.1. State date of birth and educational qualifications.

RESPONSIBILITY. Pontoons at Young Sound, Greenland, carrying stores to a Sunderland of R.A.F. Coastal Command, during the British North Greenland Expedition. A share in such exciting missions is a likely part of every pilot's and navigator's future.

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The Royal Air Force *Flying ...and a career*

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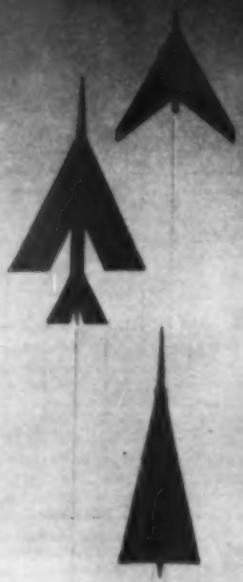


UNPARALLELED ACHIEVEMENTS

Squadron Leader J. F. Fifield, D.F.C., A.F.C., made aviation history when he successfully ejected from a Meteor aircraft at runway level during September and again the following month at an altitude of more than 40,000 feet.

Martin-Baker Fully Automatic Ejection Seats were used for both tests, proving yet again that these seats are undoubtedly the finest in the world of aviation.

NOTE TO AIRCREW:

The Seat used for the runway ejection was fitted with modified time release, not yet incorporated in Service equipment.

MARTIN-BAKER

THE DE HAVILLAND D.H.9 . . .

A new lease of life was given to the South African D.H.9s by fitting them with new engines. Some had the Armstrong-Siddeley Jaguar IV radial. In 1927 a number of D.H.9s were converted at the Artillery and Aircraft Depot, Roberts Heights, to have the 420 h.p. Bristol Jupiter VI. The Jupiter-powered aircraft was named Mpala and had a greatly enlarged gravity tank in the centre-section.

An improved Mpala appeared with the 460 h.p. Bristol Jupiter VIII engine driving a four-bladed airscrew. This variant had a new oleo undercarriage, light struts connecting the ailerons, and a rounded top-decking abaft the rear cockpit. The later Mpala appears also to have been known as the Mantis. The Mpalas remained in service until 1937; after 1930 they were used as trainers.

After the Armistice, many D.H.9s were bought by other nations. The type was used by the Royal Hellenic Navy immediately after the war. Holland placed her first order for D.H.9s on May 31st, 1919. Twelve were supplied then, 14 more in 1921 and ten in 1922. The Dutch D.H.9s were used by the Netherlands East Indies Air Force and were primarily numbered in the Dutch H series, commencing at H.101. Some were extensively modified: a flat frontal radiator was fitted and the Puma fully cowled, horn-balanced ailerons and elevators were used, and a long-range fuel tank could be carried between the undercarriage legs. This version of the D.H.9 remained in use until about 1930, and was known as the Type HL, the aircraft being numbered with that prefix.

The Netherlands East Indies Air Force also used D.H.9 ambulances which were very similar to the machine which was used by the R.A.F. in Somaliland; the ambulances were numbered HA.1 onwards. In the 1930s some of the Dutch D.H.9s were fitted with Pratt and Whitney Wasp radial engines, a modification which resulted in the use of the prefix HW to the aircraft's serial numbers. The Wasp-powered machines were still in service in 1934.

The D.H.9 was flown in Poland. Twenty were used in the defence of Lemburg, but their pilots did not understand the use of the variable-incidence tailplane and all the aircraft eventually crashed. From the remains one complete D.H.9 was assembled and was found to fly quite well.

D.H.9s were reported to be still in use in the Spanish air force as late as 1935. It is uncertain whether these aircraft were true D.H.9s or D.H.9Bs. The 9B was a promising development of the basic design which had been produced by the Aircraft Disposals Co. at Waddon. The prototype, registered G-EBAN, appeared in 1922. The engine of the D.H.9B was a 360 h.p. Rolls-Royce Eagle VIII which was fully cowled and had two Lamblin radiators mounted between the undercarriage legs. The aircraft was given full military equipment and sent to Spain to compete in a government competition for military aeroplanes which was held in February 1923. The D.H.9B was sufficiently successful to win an order for a small batch.

Among the motley collection of aeroplanes which the British Air Mission took to Japan in 1921 was one D.H.9. It had been selected as an example of a single-engined day bomber.

The D.H.9 was widely used for commercial purposes. That this was so was no doubt attributable to its availability and its pleasant flying characteristics, for the dismal record of the Puma engine in operational use could hardly have commended it as a thoroughly dependable passenger-carrier. The first commercial passenger-carrying flight to the Continent was made on July 15th, 1919, by a D.H.9 belonging to Aircraft Transport and Travel, Ltd., the subsidiary of the Aircraft Manufacturing Co. The machine was piloted by Capt. H. Shaw and his passenger was Major Pilkington.

The D.H.9 in question had been H.9277 in its Service days, and was at first registered K.109. In April 1919 it became G-EAAC. When the Aircraft Manufacturing Co. closed down this D.H.9 became the entire fleet of the de Havilland Aeroplane Hire Service and was modified by them to carry either two passengers or a small load of freight in the rear cockpit. It was made the subject of an experiment by the de Havilland company to see how long an aeroplane would last with normal use, and was not retired until 1933 after 15 years' continuous service, during which it logged some 5,000 flying hours. It ended its days as a D.H.9J, powered by an Armstrong-Siddeley Jaguar radial engine.

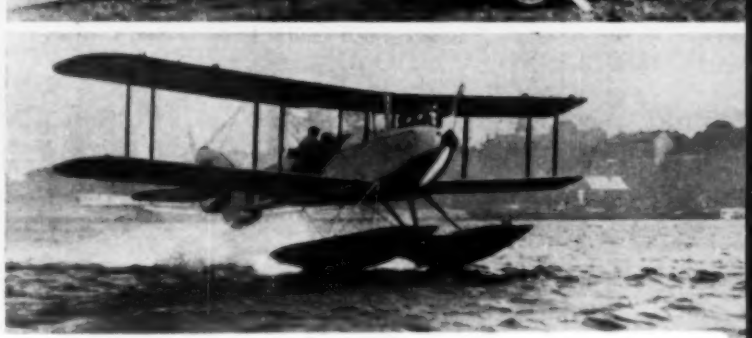
Soon after a three-seat civil version of the D.H.9 had appeared, a special commercial development of the type was built in small numbers under the designation D.H.9C. This variant had seats for three passengers, two of whom sat behind the pilot under a curious unglazed canopy with open windows, whilst the third occupied another cockpit in front of the pilot. Some 9Cs dispensed with the rear canopy, but all were characterized by a marked degree of sweepback on the mainplanes to compensate for the extra load so far behind the c.g. The D.H.9Cs were chiefly used for joy-riding and were in use until 1931.

Top, a "Flight" copyright photograph of a D.H.9C—the civil cabin version of the D.H.9—with a frontal radiator for its Puma engine. The second picture shows the D.H.9R single-bay racing machine with Napier Lion engine. Of the two views below, the first shows a D.H.9 with Handley Page slots, but before the fitting of the special tall undercarriage. Last is a D.H.9 seaplane on test at Rochester.

In 1920, Lts. R. J. Parer and J. C. McIntosh flew a D.H.9 from England to Australia in the face of great difficulties. Ray Parer later pioneered air transportation in New Guinea in 1927, using a D.H.4, a Bristol Fighter and a D.H.9, whilst in his native land of Australia, Queensland and Northern Territory Aerial Services, Ltd., introduced two D.H.9Cs in 1923. These D.H.9Cs had the pilot well aft, behind the passenger cabin.

The D.H.9C had been preceded in point of time by a single-seat racing machine known as the D.H.9R. Little resemblance to the basic design was discernible in this variant, for it had single-bay wings of unequal span and was powered by a Napier Lion engine. The D.H.9R was originally registered K.171 and became G-EAHT in July 1919. In the hands of Capt. Gathergood it set up a number of British speed records during the autumn of that year.

In 1920 the Handley Page slot was first demonstrated in public. The aircraft to which the slots were fitted was a D.H.9, H.9140, which acquired the Handley Page type number H.P.17. At first the machine had a standard D.H.9 undercarriage, but this was later replaced by an unusually tall undercarriage in order to give an



THE DE HAVILLAND D.H.9 . . .

angle of attack big enough for the slots to be effective at take-off and landing. Slots were fitted along the entire leading edge of upper and lower mainplanes, and the tests conducted with the D.H.9 proved the effectiveness of the device beyond all doubt.

A later experimental use of a D.H.9 was made by Sir Alan Cobham in his early experiments in flight refuelling. The aircraft was a plain Puma-Nine, G-AACR, modified to act as the tanker aircraft: for this purpose a fuel hose and reel were installed in the rear cockpit.

A seaplane version of the D.H.9 existed. It had simple wooden pontoon-type floats made by Short Brothers. The D.H.9 floatplane was used in Bolivia.

The final derivative of the D.H.9 was the D.H.9J, of which about 12 were made. All the D.H.9s of the de Havilland Reserve School were converted into D.H.9Js by fitting them with Armstrong Siddeley Jaguar radial engines: the initial letter of the engine's name provided the suffix in the aircraft's designation. The engines were by no means new, for they had been bought from Imperial Airways and some had flown for 4,000 hours as the power units of Armstrong Whitworth Argosies. Nevertheless, the Jaguar made a considerable difference to the D.H.9's performance, and handling characteristics were also enhanced by the fitting of D.H. differential ailerons. Improved undercarriages were also fitted; springing was by means of rubber in compression in place of the rubber shock-cord of the original undercarriage.

One of the D.H.9Js which went to Air Service Training, Ltd., G-AARS, was powered by an Armstrong Siddeley Serval IV radial and had Handley Page slots.

The last D.H.9s in Britain were G-AACP and G-AADU, which were still flying in 1937; and perhaps the last of all was the machine which, in South Africa, was among the starters for the 200-mile Round-the-Reef air race of 1938. The aircraft had been bought for £10. It is therefore uncertain whether its engine had a strong sense of tradition or was merely old—in the same way as so many of its operational contemporaries of 20 years earlier had failed to reach their objectives, so did the South African veteran fail to complete the course.

Twenty years earlier, in June 1918, Maj-Gen. Trenchard had reported from France that it was imperative that every effort be made to replace the D.H.9s with D.H.9As. Oddly enough, the D.H.9A owed less to the D.H.9 than the D.H.9 owed to the D.H.4. But its development must form the subject of a separate history.

SPECIFICATION

Powerplant.—*D.H.9:* 230 h.p. B.H.P. (Galloway Adriatic); 230 h.p. Siddeley Puma; 290 h.p. Siddeley Puma (high compression); 250 h.p. Fiat A-12; 430 h.p. Napier Lion; 400 h.p. Liberty 12-A. *D.H.9B:* 360 h.p. Rolls-Royce Eagle VIII. *D.H.9C:* 230 h.p. Siddeley Puma. *D.H.9J:* 350 h.p. Armstrong Siddeley Jaguar IIIa or IV; 345 h.p. Armstrong Siddeley Serval IV. *D.H.9R:* 500 h.p. Napier Lion.

Dimensions.—Span: 42ft 4½in. Length: (B.H.P. and Puma) 30ft 6in, (Lion) 30ft 9½in, (Liberty) 30ft. Height: 11ft 2in (11ft 7½in with Lion engine). Chord: 5ft 6in. Gap: 5ft 6in. Stagger: 12in. Dihedral: 3 deg. Incidence: 3 deg. Span of tail: 14ft. Airscrew diameter: (Puma) 9ft 6½in, (Lion) 11ft. Wing area: 434 sq ft.

Manufacturers.—The Aircraft Manufacturing Co., Ltd., Hendon, London, N.W.

Other Contractors.—The Alliance Aeroplane Co., Ltd., Cambridge Road, Hammersmith, London; F. W. Berwick and Co., Ltd., Park Royal, London, N.W.10; Cubitt, Ltd., Croydon; Mann, Egerton and Co., Ltd., Aircraft Works, Norwich; National Aircraft Factory No. 1, Waddon; National Aircraft Factory No. 2, Heaton Chapel, near Stockport; Short Brothers, Rochester, Kent; The Vulcan Motor and Engineering Co. (1906), Ltd., Crossens, Southport; Waring and Gillow, Ltd., Cambridge Road, Hammersmith, London (production of some machines sub-contracted to Wells Aviation Co., Ltd., 30 Whitehead's Grove, Chelsea, London, S.W.8); G. and J. Weir, Ltd., Cathcart, Glasgow; Westland Aircraft Works, Yeovil, Somerset; Whitehead Aircraft Co., Ltd., Old Drill Hall, Townshend Road, Richmond.

Production and Allocation.—A total of 3,204 D.H.9s were built up to the end of 1918. By October 31st, 1918, 2,166 had been distributed to units of the R.A.F., as follows: 789 to squadrons with the B.E.F. in France; 144 to the Independent Force; 52 to squadrons of the 5th Group; 92 to the Middle East Brigade; 133 to units in the Mediterranean area; 956 to training units. Eighteen were supplied to Belgium in 1918, and America bought two without engines in July 1918.

Of the 1,866 D.H.9s which were on charge with the R.A.F. on October 31st, 1918, 334 were with the B.E.F., 71 with the Independent Force, four with the 5th Group, seven in Egypt and Palestine, 21 in Macedonia, 78 in the Mediterranean area, 135 *en route* to Eastern stations, 184 at training units, 37 with squadrons mobilizing, 424 at various aerodromes, one at a coastal station, 24 at Aeroplane Repair Depots, 41 in Ireland with the 11th Group, 186 with contractors, and 319 in store.

Costs.—Airframe without engine, instruments and guns, £1,473 5s; Siddeley Puma engine, £1,089.

Armament.—One fixed Vickers machine-gun mounted on top of the fuselage immediately to port of the pilot's windscreen, firing forwards and synchronized by Constantinesco C.C. gear. One or twin double-yoked Lewis guns on a Scarff ring-mounting on the rear cockpit. There was a small bomb bay inside the fuselage, but bombs were more usually carried on external racks under the fuselage and lower mainplanes. The bomb load could consist of two 230-lb bombs, three or four 112-lb bombs, or an equivalent weight of smaller bombs.

Service Use.—*Western Front:* R.A.F. Squadrons Nos. 27, 49, 98, 99, 103, 104, 107, 108, 202, 206, 211 and 218; also used by Belgian Flying Corps. *Macedonia:* Nos. 17 and 47 Squadrons. *Palestine:* No. 144 Sqn. *Mediterranean:* Nos. 224, 225, 226 and 227 Sqns. *Aegean:* Nos. 220, 221, 222 and 223 Sqns. *Sea Patrol:* No. 212 Sqn., Great Yarmouth; No. 250 Sqn., Padstow; No. 273 Sqn., Covehithe and Westgate. *Russia:* No. 47 Sqn. at Ekaterinodar, No. 221 at Petrovsk. *Training:* Air Observers' Schools at Eastchurch, Manston and New Romney; School of Photography, Maps and Reconnaissance at Farnborough; Schools of Navigation and Bomb Dropping at Stonehenge, Andover and Thetford. Also used by No. 10 Training Depot Squadron, Harling Road; No. 31 Training Squadron, Wyton; and at Cranwell and Shoreham.

Serial Numbers.—A.7559 converted from D.H.4 by Aircraft Manufacturing Co.; B.7581-B.7680 built by Westland Aircraft Works; B.9331-B.9430 by Vulcan Motor and Engineering Co.; C.1151-C.1450, G. and J. Weir; C.2151-C.2230, Berwick and Co.; C.6051-C.6121 and C.6123-C.6349, Aircraft Manufacturing Co.; D.451-D.950, Cubitt; D.1001-D.1500, National Aircraft Factory No. 2; D.1651-D.1750, Mann, Egerton and Co.; D.2776-D.2875, Short Brothers (Fiat engine specified); D.2876-D.3274, Aircraft Manufacturing Co.; D.5551-D.5850, Waring and Gillow (50 machines built under sub-contract by Wells Aviation Co.); D.7201-D.7300, Westland Aircraft Works; D.7301-D.7400, Berwick; D.9800-D.9899, G. and J. Weir; E.601-E.700, Whitehead Aircraft; E.5435-E.5436, Aircraft Mfg. Co.; E.8857-E.9056, Aircraft Mfg. Co.; F.1-F.300, National Aircraft Factory No. 1 (only 241 machines of this batch were completed); F.1101-F.1300, Waring and Gillow; F.1767-F.1866, Westland. Others: Between and about H.5546 and H.5738, of which some at least were built by the Alliance Aeroplane Co.; between and about H.9133 and H.9340.

Notes on Individual Machines.—*Used by No. 49 Sqn.:* C.2202, C.6114, D.3052, E.623. *Used by No. 98 Sqn.:* C.2221, C.6079, C.6106, C.6108, C.6119, D.3060, D.3169. *Used by No. 99 Sqn.:* C.6202, C.6210. *Used by No. 211 Sqn.:* B.7603, C.6270, D.2782, D.3233. *Used by No. 186 Development Sqn. at Gosport in 1919:* D.3010, D.3015, D.5806, E.8888.

Claimed by Germans as shot down (up to end of September 1918): B.9334, B.9347, C.2152, C.2179, C.2182, C.6103, C.6163, C.6196, D.489, D.501, D.759, D.868, D.902, D.1029, D.1032, D.1046, D.1048, D.1135, D.1719, D.1728, D.1729, D.2831, D.2900, D.2917, D.2918, D.2931, D.3039, D.3088, D.3106, D.3213, D.3218, D.3254, D.3264, D.5571, D.5647, D.5729, D.5842, D.7234.

Other machines: B.9395, "The Mackenzie Tooloombah"; C.6052, Fiat engine; C.6078, Napier Lion engine; D.3017, to Australia, became G-AUMB; D.3117, "Z" Force, Somaliland 1919-20, converted into ambulance; D.5816, "Faridkot"; F.1181, presented to Canada, February 1919; F.1222, "Australia No. 26, Queensland No. 2, The Banchory"; F.1227, "Australia No. 27, Victoria No. 2, The Murroa"; F.1255, presented to Canada, February 1919; H.5559, used at Cranwell; H.5648, "Voortrekker"; H.9133, H.9243 and H.9274, sold to Estonia.

WEIGHTS AND PERFORMANCE

Aircraft	D.H.9							D.H.9C	D.H.9J	D.H.9R
Engine	Galloway-built B.H.P.	Siddeley-built B.H.P.	Siddeley-built B.H.P. with two 230-lb bombs	230 h.p. Siddeley Puma	290 h.p. Siddeley Puma	Fiat	Lion	230 h.p. Siddeley Puma	Jaguar	Lion
Weight empty (lb)	2,193	—	2,203	2,230	2,232	2,460	2,544	2,400	2,200	—
Military load (lb)	545	545	931	545	545	545	545	855	545	—
Fuel and oil (lb)	545	—	535	550	550	395	568	615	550	—
Weight loaded (lb)	3,283	3,280	3,669	3,325	3,327	3,400	3,667	3,870	3,295	3,219
Maximum speed (m.p.h.) at:										
10,000ft	110.5	114	111.5	109.5	116	117.5	138	110 at ground level	135	150 at ground level
15,000ft	102	106	97.5	102.5	106	107.5	134		129	
Climb (min and sec) to:										
6,500ft	—	8 40	11 00	10 20	7 50	9 00	—	—	—	—
10,000ft	19 55	15 20	20 05	18 50	13 55	16 00	7 10	—	9 00	—
15,000ft	—	30 05	45 00	42 00	28 00	32 20	13 05	—	—	—
Service ceiling (ft)	16,000	18,000	15,500	15,500	17,500	17,500	23,000	—	—	—
Endurance (hr)	4¼	—	4¼	4¼	—	—	3¼	5	3	—

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The MD.20 for 60 p.s.i. working pressure has a pressure drop of ½ p.s.i. at 5 c.f.m. flow, weighs 1.0 lb. and is rated at 0.15 amp. and 24 volt. Other types control air flows up to 1 lb./sec.

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POSTSCRIPT to the Tu-104

More about the Design—and the Designer

The Tu-104's designer, A. N. Tupolev, seen at Moscow Airport with A. K. Starikov, pilot of the aircraft on its recent flights to London.

DETAILED accounts of the Tu-104, prepared mainly from observations and deduction, have appeared in our last two issues. Official "background" information has been hard to come by, but the study of current Russian newspapers and magazines, and further probing into certain design features, has yielded new information which ought not to pass unrecorded.

The designer, Andrei Nikolajev Tupolev—who is shortly to visit this country—has been prominently featured in interviews and articles. "In all his activities," one periodical reports, "Tupolev is always working in accordance with the rules of the Party and the Soviet Government, constructing aircraft by applying the latest technology which makes it possible within the shortest time to construct the model and begin commercial manufacture." Now in his 67th year, Tupolev has been designing aircraft since the First World War. He has been responsible for about 80 designs, and is a "Hero of Soviet Work," one of Russia's highest civil appointments. He has received also many Stalin Prizes and is a deputy in the High Soviet. In 1916 or thereabouts he was employed by the Dux factory where he was engaged on a hydroplane project. This machine, it is recorded, did not come off, "since Czarist officials gave preference to foreign constructors. . . . Only after the great Revolution of October 1917 was he able to show his creative ability and talent."

The first aircraft to which he put his initials was the ANT-1 of 1922, a small single-seat monoplane (rather like the D.H. 53) with an 18 h.p. inverted Blackburne Tomtit. His next two machines were also British-engined: the ANT-2, a three-seat high-winger with a 100 h.p. Bristol Lucifer, was the first all-metal Russian aircraft, "becoming the model for further Soviet all-metal designs." The ANT-3, a small biplane of 1926 (the *Proletarian*) had a 450 h.p. Napier Lion. His first really successful design was the ANT-9 of 1929, a high-winged nine-passenger tri-motor known as *Soviet Wings*. It had Gnôme Rhône Titan engines, or alternatively Wright Whirlwinds, and during the '30s was the mainstay of Russia's civil air services.

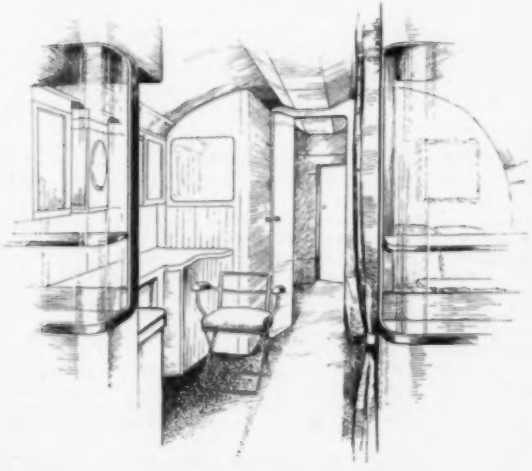
Tupolev's most famous design of all, however, was the astonishing eight-engined ANT-20 *Maxim Gorki* of 1934, "a propaganda aircraft" carrying 40 passengers (with a crew of no fewer than 23!) and equipped with a printing press for the preparation of leaflets, radio and loudspeakers for broadcasting from the air, a cinema projector, and electric sign-lighting for the display of slogans. The *Maxim Gorki* was followed by the ANT-25, famous for its long-distance record flights. This machine gained the world distance record in 1937 with a 6,262-mile flight across the Pole from Moscow to San Jacinto, California.

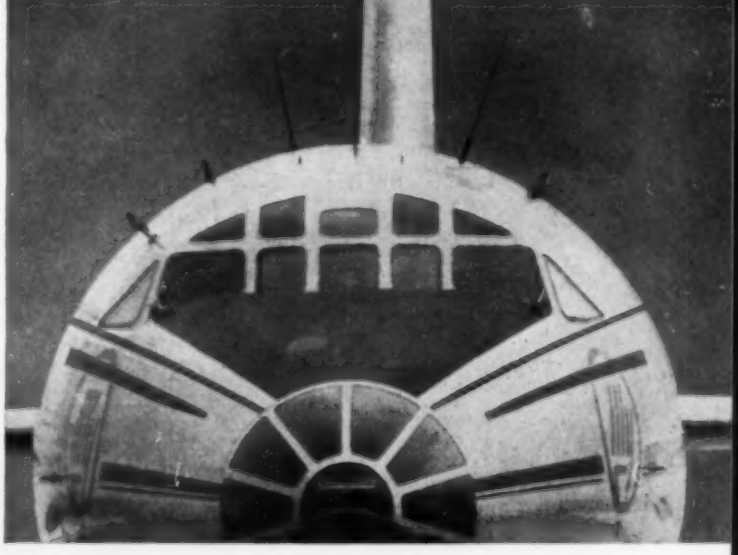
It was during the Second World War that the "Tu" series began, the best known of which was undoubtedly the Tu-2, the heavily armed twin-engined bomber which is still in first-line service with the Chinese and Polish air forces. Tupolev's post-war work gave the Soviet Air Force the Tu-4 (B-29 copy), of which a civil development the Tu-70 was produced in small numbers, and it is possible —although no conclusive proof exists—that the Bison bomber is his handiwork. Many other designs have been attributed to him, including the Badger bomber, but notwithstanding this aircraft's resemblance to the Tu-104 it has also been attributed to Ilyushin.

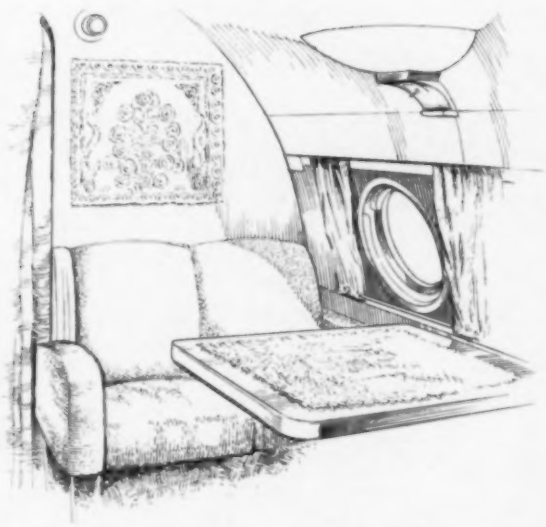
Few points about the Tu-104 have aroused more curiosity and speculation than its radio and radar aerials, with which it positively bristles, and which must certainly produce sufficient drag to knock 10 or 15 m.p.h. off cruising speed. An assessment of the Tu-104's radio equipment must consist of more or less inspired guesses as to the use of the aerials, since no one has been able to examine the actual equipment. The Russians were prepared for operations in Western Europe and it must be assumed that they have at very least a working knowledge of equipment that was used by the Allies and the Germans during the war. The Tu-104's aerials most probably indicate the use of communications radio from L.F. to V.H.F. bands and some form of lattice navigation system with the addition of an approach aid.

The long wire aerial strung from fin to cabin-top is divided into two sections. These could serve communications sets in two of the three bands, L.F., M.F. or H.F. One might possibly be used directionally for A.D.F. The two together might give simultaneous reception of one wave band on two radio sets. It seems most likely that they serve M.F./H.F. communications

(Below) A "Flight" artists's illustration of the view looking forward through one of the two buffets. There are two facing double chairs to starboard in each buffet. Note the generous amount of transparent panelling, and the portable chair for the steward. (Right) Deductions about the Tu-104's complement of radio aerials, seen here, are made in the text.







Above, the main 28-seat cabin, with its heavy light-fittings and luggage racks. Note the oxygen sprays. Right, a "Flight" artist's impression of a V.I.P. saloon, notable for its ornamentation.

POSTSCRIPT TO THE Tu-104 . . .

radio. Use of M.F. is probable in view of its good performance in the far north.

The head-on picture on p. 427 shows one sword-blade aerial at 11 o'clock which is balanced by a similar one at five o'clock (not shown). These could be quarter-wave aerials for H.F. or V.H.F. communications, or connected with a lattice aid of the Gee type. Similarly the whip aerial at two o'clock could serve the same purposes. It seems likely that the two sword blades serve V.H.F. and the whip a lattice navigation system of some kind, such as a Russian version of Gee.

There are two short dipoles, one behind the central panel of the transparent nose cap and the other beneath the fuselage abreast of the engine intakes. Their exact purpose can only be guessed, but since the unit in the nose has a feeder possibly too small for transmission, and dimensions suggest reception of frequencies in the hundreds of Mc/s from directly in front of the aircraft it might be a glide-slope receiver of the I.L.S. type. But it also resembles the American wartime AYF radio altimeter aerial, and might be the receiver for the other dipole under the fuselage which would act as the radio altimeter transmitter. The dipole underneath the fuselage could possibly be used as the sense aerial for an A.D.F. loop suppressed elsewhere; no loop shows externally. A reasonable combination would be glide-slope aerial in the nose and marker-beacon receiver under the fuselage, with the localizer aerial possibly in the fin-top. The plastic fin-top might house any type of aerial or none at all. The radome under the nose suggests a forward- and downward-looking scanner. All-round scan of the H2S type is highly improbable and the installation is poor for weather radar work. This is probably still the Badger bomb-sight radar.

The greatest enigma is the fence aerial along the side of the fuselage mounted on an impressive number of stand-off insulators. It is too long for radar and not balanced by the plastic-shielded aerial (itself of most uncertain purpose) on the other side to make it directionally sensitive. It might not be an aerial at all, but possibly some form of static discharge attachment, though discharge spikes are already on the control surfaces. It might possibly be used to excite a large section of the fuselage to form a high-powered aerial, but the mounting is very crude. If it were a sensing aerial for A.D.F. it would more probably be mounted underneath the fuselage and aft of the wing. It seems most probable that this is a H.F. aerial of fairly advanced conception but fitted at the last moment specially for use over Western Europe.

Though the function of the aerials is not definitely established, their detail construction suggests nothing more advanced than is already to be found on airliners in Europe. There remains the final question as to why such drag-producing aerials should have been fitted on a high-speed aircraft.

Russian newspapers have been enthusiastic about the way the Tu-104 was received in London: "The English Press," said *Izvestia* on March 25th, "and both civil and military experts spoke of it in terms of the highest praise." The same newspaper states that the aircraft is the first fruit of the Supreme Soviet's five-year plan for 1956-1960, "for the operation of regular services by passenger aircraft on the main trunk lines of the Union." The prototype was built at the Moscow Engineering Works, and collective factories are now said to be building the type "in bulk quantities."

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Fighter Nomenclature

I AGREE very strongly with the feeling expressed in your March 23rd editorial that new fighters should be named as soon as possible. I don't, however, agree with your choice of names—at least, "Sea Devil" is, I think, as good as will be found for the D.H. 110; but English Electric "Terror" or "Storm"—I think not.

My suggestions would be these: "Warrior" for the P.1, "Shark" for the N.113, "Rapier" for the Gloster Javelin successor, and "Striker" for the Saunders-Roe S.R.53.

Let's hope the Air Ministry will adopt some names, at least, pretty quickly—leaving us with only the S.B.5, F.D.2, P.D.11, P.74 and Types 187, 192 and 193 to worry about!

Hampton Hill, Middx. P. A. TAGG.

The First Aileron

I AM sorry to be captious about the letter from Mr. T. R. Loudon on his claim for the aileron being invented by (or first suggested by) Baldwin. The modern aileron system was first described and patented by Boulton in 1868, but this remarkable feat was overlooked, owing to its being incorporated in an otherwise worthless invention, and then completely lost to view until well into this century.

The first actual use of ailerons was by Santos-Dumont on his "canard" box-kite biplane "14 bis" which made the first official powered flight in Europe in 1906. Few photos of this ugly monster show the ailerons as they were only fitted later on in the year in time for the record flight. The ailerons were hexagonal and one was fitted midway between the wings in each outer box-kite "cell."

The subsequent history of the aileron is well known, *via* Bleriot's almost forgotten 1907 monoplane (which just flew), on to Baldwin, Curtiss and the rest. The really practical aileron was the type invented by that splendid ex-patriot Englishman Henri Farman in 1909.

London, W.1. C. H. GIBBS-SMITH.

Early Days of No. 830 Squadron

IN the article "Eagle's Talons" (*Flight*, March 9th) it was stated that No. 830 Sqn., F.A.A., was formed in Malta in 1942 with largely New Zealand personnel. I am sure this is not so, as I arrived at R.A.F. Station Hal-Far, Malta, on May 12th, 1941, to help form 185 Sqn., and 830 were already there, operating Swordfish—with, may I add, great success against ships on the North Africa run. In the book *The Air Battle of Malta*, published by H.M.S.O., the Swordfish are mentioned in early March '41, when three of them and one of the famous Gladiators, were burnt out in an air attack on Hal-Far.

As for N.Z. personnel, I cannot remember any, although two or three R.A.F. air-gunners were attached in 1941, and several ground crew for a longer period (one of them was posthumously awarded the M.M. for fighting a fire at the torpedo shop following an air raid).

During the "blitz" aircraft losses could not be replaced, so

gradually Albacores of 828 Sqn., which arrived about August 1941, were taken over, this squadron being disbanded. By June 1943 only about three or four aircraft of each type were left.

As our squadron moved about this time, my memories of 830 end; probably it was disbanded. Moving back to Hal-Far four months later, only one Swordfish was left, and this was flown by the R.A.F. for A.S.R. duties.

Abingdon, Berks. K. Cox.

"Simplication" Disclaimed

IN your notice on the death of Bill Stout, I notice you attribute to him the phrase "Simplicate and add more lightness."

If you will refer to his book *So I Went Away* you will find, at page 135, that he disclaims the invention of the expression.

London, W.1. F. H. Smith,
Librarian, Royal Aeronautical Society.

Veteran DC-3s

WITH reference to Dennis M. Powell's letter in your March 23rd issue: I would like to point out that Pakistan International Airlines took over only two Convair 240s from Orient Airways, and not three as Mr. Powell states. AP-AEG, the third one, crashed on March 16th, 1953, in Kalasahar.

B.A.O.R. 19. P. W. Vollborth.

Rank Heresy?

I WAS surprised to see in your report on Service pay increases (*Flight*, March 2nd) the use of the term "other ranks" applied to personnel of the Royal Air Force below officer status. Queen's Regulations for the R.A.F. define personnel of and below the rank of Warrant Officer as airmen (airwomen in the case of the W.R.A.F.).

I believe that at a time when the Service is making serious efforts to boost regular recruiting the term "airmen" may be better calculated to appeal to self-respect and give an increased sense of "belonging" than does the British Army expression "other ranks"—a term which must always convey a feeling of inferiority.

Oslo, Norway. R. F. Kendall,
Flight Sergeant, R.A.F.

"Collectors' Items"

I FOUND the pictorial pages entitled "Collectors' Items" (March 23rd) extremely interesting, particularly the Sunbeam biplane and Handley Page R.100. Mr. J. M. Bruce may be interested to know that I have a print of Grain Griffin N100, with a normal-type fin and rudder in place of the horn-balanced example.

Birmingham 14. Maurice Austin.

Long-service Chief Inspectors

WITH reference to the news item "Veteran Chief Inspector" in *Flight* of March 23rd: I do not wish in any way to detract from the long service of Mr. Johns as chief inspector at Vickers-Armstrongs (Aircraft), Ltd., Supermarine Works, but just to draw your attention that this long service of his does not constitute a record in the industry, as is suggested might be the case. I just pip Mr. Johns by one year, having served as chief inspector with the Westland Aircraft Company, Yeovil, for 27 years.

Yeovil. R. B. Brigham.

THE MANUFACTURE OF BULLET-PROOF GLASS

THE manufacture of bullet-proof glass for aircraft has long been a speciality of the Triplex Safety Glass Company, Ltd., one of whose factories is at King's Norton, Birmingham. There a group of test pilots was recently shown the manufacture of the bullet-proof glazed units being supplied for the majority of aircraft now in R.A.F. and F.A.A. service.

Although the processes of toughening and assembly of windows have not greatly altered in the past few years, the purpose of the strengthening has to some degree changed. No longer is resistance to gunfire the primary objective. Resistance to skin-friction heating, and to internal loads from pressurization, and to bird impact are more important for present and future aircraft.

Strength is achieved by bonding together layers of toughened glass and interlayers of vinyl plastic; any thickness of interlayer can be used. Assembly is carried out in dust-proof, temperature-controlled rooms in order to avoid blemishes. Once the "sandwich" of glass and vinyl is assembled it is first passed through heaters and rollers for preliminary adhesion and then placed in an autoclave which subjects it to a temperature of about 120 deg C and an air pressure of 100 lb/sq ft. Bullet-proof screens of various dimensions are assembled in jigs and the edges ground to the correct profile. They are then bonded as described above.

Curved panels are produced by heating glass to its softening point of about 600 deg C and laying it in a female mould, to which it then accommodates itself by sinking under its own weight. This moulding is done before the vinyl interlayer is applied, as the latter will not withstand a temperature of more than 80 to 100 deg C.

The final panel must be optically tested and proved to within close limits for transparency and freedom from distortion, especially if gun- or bomb-sights have to be laid through it. A special clear glass was developed to this end some years ago. Panels are also tested in extreme cold and heat.

Though jets of hot air are commonly used for demisting, fine meshes of electrically heated wires between the glass layers are also frequently employed. In certain light conditions, however, the wires glitter, and at high altitude they tend to attract the focus of the pilot's eyes and prevent him from seeing outside the aircraft. An alternative now being applied is a fine film of gold electrically heated which will still maintain the transparency of the panel at an acceptable level. The direct cost of the gold is merely a matter of pence per square foot. In the application process the glass is placed in a vacuum chamber containing two large cathode plates. One is covered with a layer of gold, so that when a high D.C. voltage is fed into it, a gas discharge is struck and particles fall on to the glass at concentrations which can be regulated. Thereafter the gold is made to adhere to the glass by a similar discharge from the other cathode, which is fitted with a bismuth plate and discharges bismuth oxide.

The glass gives 80 per cent light transmission. Heating the gold to 25 deg C requires 1,000 W/sq ft, or about as much as the aircraft system can usually supply. Resistance is 5 ohms. Temperature is generally regulated by a heat-sensitive resistance which, set in the interlayer, blocks current when the desired temperature is reached.

For very-high-speed flight, where skin friction becomes a problem—as in the Fairey Delta 2—an extra outer layer of toughened glass is added and separated from the normal laminated panel by an air-space which gives good temperature insulation. Where the outer layer reaches high temperatures, the inner layer will stay below the critical level for the vinyl for about 20 to 30 minutes. The outer layer can withstand some 300 deg C. This is sufficient for test work, but not for such a project as a supersonic long-range aircraft.

The Triplex Company can claim unrivalled experience in the techniques and skills required to produce this type of transparent panel for aircraft.

MORE CONTRIBUTORS TO THE RECORD

AT the conclusion of the article "Getting the Record," in *Flight* of March 23rd, we gave a list of some of the firms whose products were used in the Fairey F.D.2 which gained the world speed record at 1,132 m.p.h. A further list—provided, as was the other, by the manufacturers of the aircraft—has since become available and is given below:—

Acorn Springs, Ltd.; Anderton Springs, Ltd.; B. Attewell and Sons, Ltd.; Automotive Engineering Co., Ltd.; Bakelite, Ltd.; Birmetals, Ltd.; Thos. Bolton and Sons, Ltd., Thomas Boorn and Co., Ltd., James Booth and Co.; Bowden, Ltd.; British Aluminium Co., Ltd., British Industrial Plastics; British Paints, Ltd.; Bryce Weir, Ltd.; Bulgin and Co., Ltd.; Cellon, Ltd.; Coopers Mechanical Joints, Ltd.; Cork Manufacturing Co., Ltd.; Dubilier Condenser Co. (1925), Ltd.; Dzus Fasteners (Europe), Ltd.; English Electric Co., Ltd.; English Steel Corporation, Ltd.; Everett and Co., Ltd.; Expanded Rubber Co., Ltd.

Thomas Firth and John Brown, Ltd.; Firth Vickers Stainless Steels, Ltd.; Fischer Bearings Co., Ltd.; Flexall Springs, Ltd.; Folland Aircraft, Ltd.; Fothergill and Harvey, Ltd.; General Electric Co., Ltd.; Glass Fabrics, Ltd.; J. J. Habershon, Ltd.; Hellerman Electric, Ltd.; High Pressure Components, Ltd.; H. M. Hobson, Ltd.; I.V. Pressure Controllers, Ltd.; Imperial Chemical Industries, Ltd.; Irving Air Chute of Gt. Britain, Ltd.; Johnson Matthey and Co., Ltd.; E. and E. Kaye, Ltd.; Kautex, Ltd.; Langley Alloys, Ltd.; Linread, Ltd.; Lion Spring Co., Ltd.; Lodge Plugs, Ltd.; Joseph Lucas (Gas Turbine Equipment), Ltd.

M.A.M. Rubber Co., Ltd.; Mechanism, Ltd.; Midland Silicones, Ltd.; Mollart Engineering Co., Ltd.; Mullard Valve Co., Ltd.; Murex Welding Processes, Ltd.; N.S.F., Ltd.; D. Napier and Son, Ltd.; Northern Rubber Co., Ltd.; J. Penney and Sons; Plasticable, Ltd.; R. B. Pullin and Co., Ltd.; Renown Springs, Ltd.; Renold Chains, Ltd.; Rotameter Manufacturing Co., Ltd.; Sangamo Weston, Ltd.; Shell-Mex and B.P., Ltd.; Simmonds Aerocessories, Ltd., Sperry Gyroscope Co., Ltd.; Standard Insulator Co., Ltd.; J. Stone and Co. (Deptford), Ltd.; T.I. Aluminium, Ltd.; Tecalemit, Ltd.; Herbert Terry and Sons, Ltd.; Ronald Trist and Co., Ltd.; Tungum Co., Ltd.; Valay Industries, Ltd.; Varley Dry Accumulators; Wallop Industries, Ltd.; A. Wells and Co., Ltd.

AIRCRAFT REPAIR FROM A NEW ANGLE

THE use of Dexion angle material in aircraft factories is a familiar enough sight, but its emergency employment as an integral part of an airframe structure is a distinct novelty. The aircraft in question was a Burma Airways DC-3, XY-ACT, which was severely damaged by an explosion when touching down at Pakokku, an airfield 40 miles north of Rangoon; the damage was later found to have been caused by a land mine laid under the grass strip (and, evidence suggested, exploded by remote control at the crucial moment).

The detonation severely damaged the under-side of the fuselage —as will be seen in the first of the three photographs below— and the blast effect was so great that both wing-tips were reduced to scrap metal, while even the tip of the tail fin was damaged.

Hong Kong Aircraft Engineering Company were asked to survey the damage and one of their engineers was flown to Burma to recommend a method of salvage. In view of the surface-transport difficulties, it was decided that the aircraft should be temporarily repaired so that it could be flown to its base at Rangoon and then on to the H.A.E.C. base at Hong Kong for final repair.

Using another DC-3 as a mock-up, the company proceeded to design and stress a repair structure made up of Dexion steel angle 225/80. After assembly and marking and numbering, the structure was dismantled for flying to Pakokku.

For the general fuselage repair and for the centre section trailing-edge structure a total of 2,200ft of Dexion was used. In order to meet official requirements, aircraft-type AN3 and AN7 bolts were used for close-tolerance fits (their number totalled 2,400). The centre-section repair made use of wooden formers bolted to the Dexion, the whole afterwards being fabric-covered.

H.A.E.C. despatched a repair team to Pakokku to install the scheme and to prepare the aircraft for its return flight. The work was completed and the aircraft test-flown by Capt. Leong of Union of Burma Airways, a veteran pilot of China National Aviation Corporation. The DC-3 was flown without flaps and required no trim for straight and level flight. After a check inspection of the repair it was flown to the Burma Airways base at Rangoon in transit to Hong Kong.

The aircraft was subsequently flown by Capt. Leong in extremely rough air conditions to H.A.E.C. at Hong Kong, being periodically inspected in flight by the crew.

INDUSTRY NEWS IN BRIEF

F. G. Miles, Ltd., announce the formation of Miles Structural Plastics, Ltd., with a nominal capital of £10,000. The new company has taken over all activities of the Plastics Division of F. G. Miles, Ltd., as from April 3rd. Miles activities in the plastics field are particularly identified, so far as aircraft are concerned, with the moulding of Durestos resin-bonded asbestos.

* * *

On March 19th ground-breaking ceremonies were held in Melbourne for the new plant of Black and Decker, Australasia, Ltd., which, when completed by March next year, will manufacture Black and Decker portable electric tools for sale in Australia and New Zealand.

* * *

Mr. C. H. T. Johnson, commercial director of Decca Radar, Ltd., has been elected chairman of the Radio Communication and Electronic Engineering Association for the present year, in succession to Mr. S. J. Preston, a director of E.M.I. Electronics, Ltd., who becomes vice-chairman. During his war service with the R.A.F. Mr. Johnson was Technical Officer at H.Q. 60 Group.

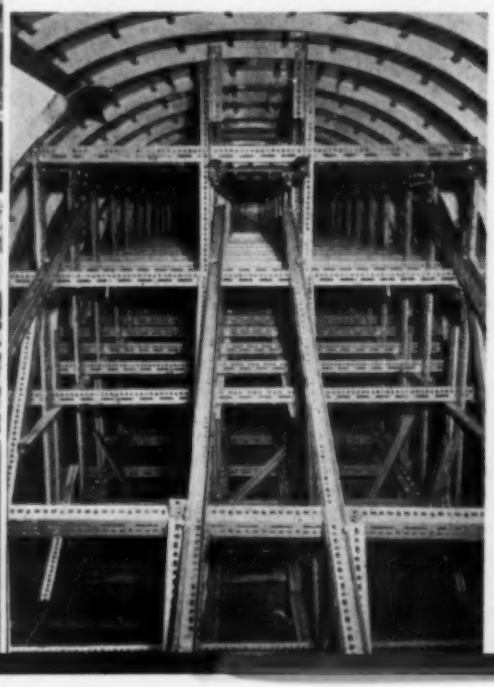
Douglas Equipment, Ltd., of Cheltenham, announce the resignation of Air Marshal Sir Alick C. Stevens from their Board.

* * *

The heading to a recent news item on the appointment of Mr. V. C. Varcoe as aviation sales manager, Shell-Mex and B.P., Ltd., in succession to Mr. J. C. C. Taylor, implied that he had only recently joined the firm; as the paragraph itself made clear, however, he has been with the company since 1925.

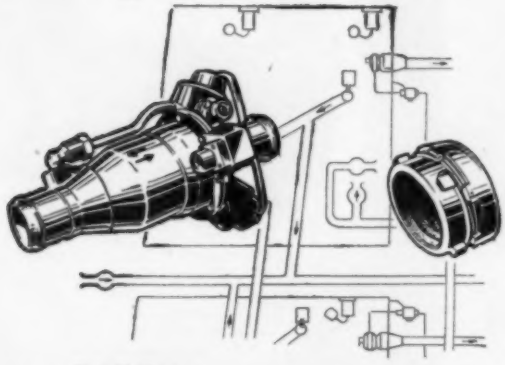
* * *

New contracts for 187 aircraft-towing tractors, ordered by the Ministry of Supply on behalf of the Royal Air Force, brings the value of such orders currently in hand at the David Brown Industrial Tractor Division to approximately £250,000. In the last five years, it is stated, over 750 David Brown aircraft-towing tractors have been supplied to the R.A.F. During the same period over 150 similar machines have been delivered to the Ministry of Civil Aviation, the Royal Navy and the Royal Canadian Navy, and to the Air Forces of Pakistan, Denmark, Canada, Australia and New Zealand.



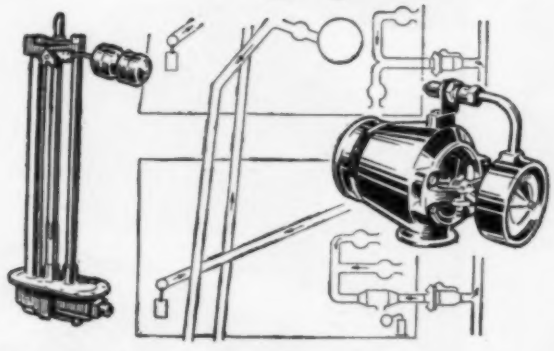
The view on the left shows XY-ACT (see top of page) after the explosion. The lower picture, left, illustrates how the centre-section repair was made with Dexion angle. The third view shows the stiffening in the interior of the fuselage. The structure was made slightly asymmetrical in order to allow space for aircrew to crawl through and inspect the assembly in flight. When the aircraft was permanently repaired, the Dexion angle was used by H.A.E.C. to make maintenance stagings for their works.

a complete fuel system



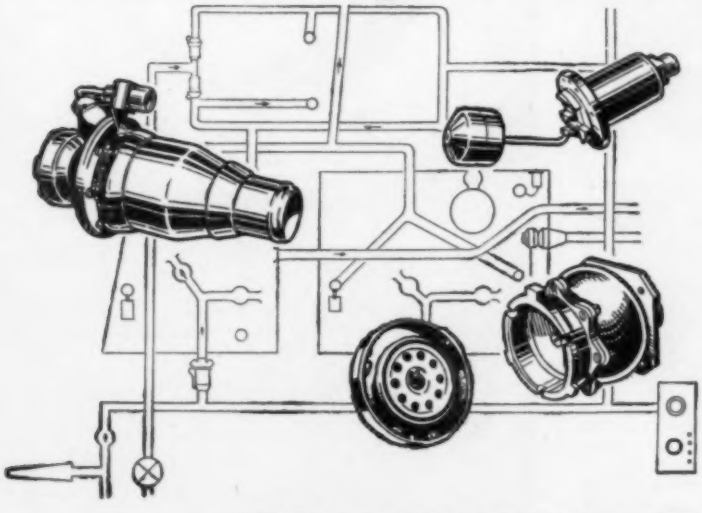
Since pressure fuelling became essential for the majority of aircraft, further developments have taken place in aircraft design which now make it desirable for fuelling, defuelling and engine feed systems to be treated as a common problem. For refuelling in flight or on the ground the system is the same; only the filling point is different.

from filling point to fuel tanks



To meet these requirements F-R Ltd., pioneers of pressure fuelling, have accordingly developed a comprehensive range of components, many of a multi-purpose nature, suitable for building into complete fuel systems of any capacity. No longer need the designer duplicate or even triplicate his fuel lines to comply with the specified requirements. The fuel system now becomes a carefully integrated installation planned throughout for maximum efficiency and minimum weight.

with F-R components all along the line



F-R components are installed in all the latest British aircraft and are used by leading aircraft manufacturers in almost every country. They ensure the highest possible standard of speed and reliability in refuelling operations.

F-R COMPONENTS ILLUSTRATED:

Top: Mk. 19 in-line valve. Pipe connector.

Centre: Variable level float switch. 2 Stage pressure relief valve.

On left: Mk. 18 in-line valve. Mk.12 float switch. Coupling-Aircraft unit.

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Aer Lingus' Viscount "St. Patrick" leaves Collinstown, Dublin, on one of the 33 Easter holiday Viscount services to London. The company's decision to adopt the Fokker Friendship as a partner for the Viscount is reported on the next page.

CIVIL AVIATION

CAPITAL AND THE BRITANNIA

FOR some time now Capital Airlines, America's delighted Viscount operators, have been looking closely at the potentialities of the bigger turboprop. Their studies of the Britannia, it appears, have been promising enough to prompt Mr. J. H. Carmichael, the airline's president, to sample the aircraft for himself, and on Thursday of last week he flew to England with a party of senior Capital men for a three-day visit to Bristol. He was later subjected to the inevitable questions about the likelihood of orders (a newspaper report said that Capital "were understood" to have ordered ten, and to have placed an option on a similar number) which he countered with: "I can say it is a very fine aircraft and I am very pleased with its performance. But there will be many more discussions and a lot of figures to discuss before we sign on the dotted line." Mr. Carmichael flew in a B.O.A.C.-operated Britannia from London Airport to fly a stage comparable with his company's New York-Chicago route (as ill luck would have it, the aircraft had to turn back when 100 miles from Copenhagen due to an engine's excessive jet pipe temperature.

After the visit to Bristol the Capital Airlines party called on Vickers-Armstrongs "to discuss the delivery programme and to talk about new models and new developments." Mr. Carmichael described as "premature" reports that Capital intended to purchase a further 30 Viscounts.

At the time of going to press a Britannia was due, on a date in the very near future, to make landing and take-off tests at Dyce airfield (near Balmoral, the Royal Family's traditional Scottish home) and at Wick airfield. The aircraft was to be accompanied by A. Cdre. Sir Edward Fielden, Captain of the Queen's Flight, with Mr. Bill Pegg, Bristol's chief test pilot, as pilot.

I.A.T.A.'s ROLE

THE recent action of the United States Civil Aeronautics Board on I.A.T.A.'s resolution to increase by ten per cent first-class transatlantic and trans-Pacific fares raised the question of the extent of I.A.T.A.'s authority in the complex business of settling international air fares. It will be recalled that the Board at first refused to approve the increases agreed by I.A.T.A., subsequently reversing their decision in the face of strong airline protests.

No one should know better the aims and ideals of I.A.T.A. than its tireless director-general, Sir William Hildred, and in the light of the recent events it was particularly stimulating to hear his testimony to a sub-committee of the United States Congress, in which he showed how the interests of 55 governments and 73 airlines are reconciled in the machinery of international airline fare-fixing. He explained that since every government in the world is sovereign of its air space, international airlines can only operate according to agreements between governments, which adjust the varying interests of them all on a world-wide basis. Governments, Sir William said, delegate responsibility to the airlines—through the I.A.T.A. Traffic Conferences—for the adjustment of fares: proposals were then submitted to the appropriate governments for approval. Such matters as the exchange of traffic rights and the licensing of carriers "are completely outside the influence or control of I.A.T.A.," remaining the prerogative of negotiations between governments. International airline operations, Sir William added, were based on "masses of bilateral agreements" between governments, and these agreements "depend for their efficiency on subsequent agreements on the fares and rates charged by the operators."

Other points made clear by Sir William were that I.A.T.A. has nothing to do with the policy of any country as to which of its flag carriers fly on international routes; that it has nothing to do with inter-airline pool agreements; and that it confines its regulations to the "stabilization of fares and to the control of discriminatory practices." The fact that every airline had an equal vote in I.A.T.A., he added, strengthened the status of the small operator and prevented the larger ones from exercising undue pressure. The problem of rate agreements was delicate and complex: some governments believed that certain fares should be lowered, while others felt they should be increased if their national carriers were to maintain their economy. Each fare had to be treated on its merits in the light of local circumstances, and governments differed in their degree of the appreciation of the difficulties. It was not surprising that the airlines as well as governments believed that irresponsible fare-cutting "could lead to nothing but disaster": the introduction of tourist fares, although it expanded the market, did not increase financial returns to the airlines.

Sir William rounded off his testimony by quoting from the chairman of the U.S. Civil Aeronautics Board, Ross Rizley, speaking at I.A.T.A.'s general meeting last October: "It is no exaggeration to say that the existence and statesmanship of I.A.T.A., more than any other single factor, saved international air transportation in the post-war period from the disastrous rate-wars and subsidy wars that would otherwise have thwarted its sound development."

ATLANTIC ALL-CARGO SERVICE

COMPETITION for the haulage of air freight between the U.S.A. and Europe—until now shared by K.L.M., PanAm, Sabena, Swissair and T.W.A.—will be intensified when Seaboard and Western's new scheduled operation is in full swing. The inaugural service, the outcome of many months of negotiation between the United States and European governments, was on April 10th when a Seaboard and Western L.1049H Super Constellation flew into London Airport from New York *via* Shannon.

Seaboard and Western deal exclusively in air cargo, and although until now they have been operating the Atlantic on a non-scheduled basis they are the first all-cargo carrier to operate the route to a timetable. There will be five return trips weekly with L.1049Hs (18 tons capacity) and DC-4s (eight tons), and points of call besides London will be Frankfurt, Dusseldorf, Stuttgart, Nuremburg, Paris, Munich, Geneva, Zurich, Amsterdam, and Hamburg. Gander and Shannon are intermediate points on all routes.

(Left) Mr. A. Jackson Kelly, who is PanAm's new vice-president in charge of the airline's European operations.

(Right) Mr. K. J. Luplow, who, as reported below, is to take charge of Boeing's newly formed European office.

BOEING OPEN EUROPEAN OFFICE

WITH the Boeing 707 now sold to three European operators—Air France, Sabena and Lufthansa—the manufacturers have decided to establish a new office in Europe to represent the company's transport division. Under Mr. K. J. Luplow, formerly Boeing's manager of foreign sales, the office is being opened later this month in Geneva for the co-ordination of sales, contracts, engineering and spares service, public relations, and advertising. Douglas, incidentally, have a similar European organization, also based in Geneva.

HERON PRECAUTION

A RECENT case of failure of a link-rod in the rudder servo-tab control of a de Havilland Heron 2 led, in the usual way, to the manufacturers' notifying all operators of a modification. The event would, as with other minor modifications issued from time to time by aircraft manufacturers, probably have attracted little publicity but for the fact that in this instance certain Herons, notably those of Indian Airlines and Turkish Airlines, had to be withdrawn from service until the replacement parts, which were not in store, were received from England.

The Dame of Sark, Mrs. Sybil Hathaway (left), welcomes to her diminutive Channel Island the only type of mechanized transport other than farm tractors ever seen there. Also in the picture are the Dame's daughter and son-in-law, Mr. and Mrs. H. Bell. This private enterprise S.51 helicopter service, reported in "Flight" of March 30th, is operated by Mr. Ivan Donnelly and his partner, the Hon. Luke White.

CIVIL AVIATION . . .

CHARTER BY TELEPHONE

COMMENTING on the Air Services Appropriation Account, 1954-55, just published, Sir Frank Tribe, Comptroller and Auditor General, said that tenders for charter flights were sometimes received at the Air Ministry by telephone—"a departure from normal procedure." Contracts for the transport of passengers and stores by civil aircraft are placed by the Air Ministry on behalf of the R.A.F. and other departments.

It seems that, in addition to routine long-term contracts (e.g. trooping), numerous deals have been entered into for specific charter flights—the total value of which in 1954-55 was about £1.8 m.—and that it was in these that the tender board procedure was not applied. "Instead," reports Sir Frank Tribe, "a number of operators were invited by telephone to tender . . . As this system appeared to me to lack the safeguards usually applied in the placing of government contracts, I enquired as to the necessity of these departures from the normal procedure." The reply given by the Ministry was that the time factor in the air charter market did not normally permit the preparation of formal invitations and that even a few hours' delay might result in failure to obtain suitable aircraft by the due date or in the loss of a favourable offer. However, it had been decided that normal "tender board" procedure would be followed when time permitted; and when time was short quotations could be invited by telephone, subject to the approval of the head of the Ministry branch concerned, their acceptance being confirmed by another officer.

THE "RED TAPE BARRIER"

MORE than 20 governments, according to I.A.T.A., have taken practical steps towards simplifying travel this coming summer. The steps taken, says Sir William Hildred, director-general of I.A.T.A., "indicate that governments want to encourage tourist travel and realise that red tape checks its free flow. Each individual action may only be a chip off the iceberg but taken together and applied to the swelling volume of international air traffic, they mean a really substantial facilitation to world travel." For example fifteen member countries of the Council of Europe have now agreed not to require passport visas of each other's nationals; sixteen European countries no longer demand visas of American tourists, and fourteen do not ask them of Canadians.

CUTTING CONVERSION TIME

BRITISH EUROPEAN AIRWAYS now has in full operation two all-British flight simulators, built by Air Trainers, Ltd. They are for Elizabethan and Viscount 700 aircraft and a third for the Viscount 800 is being constructed. B.E.A. began training on the simulators in September 1955 and in six months completed 760 hr. Training so far completed includes 124 captains' bi-annual checks, 42 type-conversions, 33 first officers' instrument-rating renewals, and 21 refresher courses.

It is claimed that these British simulators offer the most faithful reproduction of flight yet achieved. The cost of operation is about one-fifth that of actual flight training: flight conversion of captains to Viscounts without initial use of the simulator previously occupied about 13 hr, but this is reduced to between three and five hours after ten hours on the simulator. At present the new training aids are at Northolt, but they are to be moved to London Airport to join the 800 (and, later, Vanguard) simulators. The 800 unit, incidentally, is expected to cost between £120,000 and £150,000—half the price of U.S. DC-6B simulators.

UP-TO-DATE WITH THE FRIENDSHIP

AN all-Dart partnership of Viscounts and Friendships seems to be the future fleet pattern of Aer Lingus, who, as reported in last week's issue, have just ordered the new Fokker feederliner. The order, which is for four aircraft, is the beginning of a programme to re-equip with an all-turboprop fleet: three Viscount 808 Majors will be added in 1958 to the existing fleet of five 700s, and the introduction of Friendships later that year will begin the process of replacing the company's thirteen DC-3s.

Excluding the Dublin-London route (incidentally one of Europe's busiest routes in terms of traffic volume), Aer Lingus services to other points in Britain are essentially short-haul in character (175 miles on average), which suggests either that DC-3s will continue to carry a share of the company's expanding traffic for some years hence, or that further Friendships will be needed.

It seems logical that other Viscount-Friendship partnerships will be established (K.L.M. were the first and T.A.A. may well be the next); indeed, this possibility was a factor that influenced the Fokker designers in their choice of powerplant. Development of the aircraft is continuing satisfactorily: the original Rolls-Royce Dart 507 engines (10ft Rotol airscrews) fitted to the prototype since its maiden flight last November are now being changed for the more powerful Dart 511 (1,600 s.h.p., 12ft Rotol airscrews). This will bring the power of the aircraft up to production standard, and will enable detailed evaluation of performance to be carried out. "The first rough performance checks," report Fokker after the first 50 hours of development flying, "have been most favourable," particularly, it is stated, in respect to cruising speed, which exceeds design estimates. The second prototype, now completed, has been set aside for structural tests. Progress with the third prototype includes completion of the fuselage and centre-section complete with engine nacelles; this aircraft will differ from the prototype in its de-icing system, which will be thermal (hot air for the wings, electric for the tailplanes) as opposed to the pneumatic rubber overshoes of the prototype. The latter installation is likely to be lighter than the thermal system, and operators have the choice of either. Discussions with certain airlines who operate from poor airfields have led to the decision to fit larger tyres at reduced pressure (60 lb/sq in). Work has started on construction of the fourth aircraft which will be used for fatigue-testing.

NEW SERVICES APPROVED

THE M.T.C.A. announce Ministerial approval, after consideration of the Air Transport Advisory Council's recommendations, of the following air services:—

Air Kruise (Kent), Ltd.—Inclusive tour services between Lydd and Turin *via* a technical stop at Lyons and Lydd and Luxembourg until October 31st, 1956.

Silver City Airways, Ltd.—An internal freight and vehicle ferry service between Southampton and Guernsey until September 30th, 1961.

Electronic check pilot: one of B.E.A.'s new flight simulators, described in the adjoining column, is seen here in action. This particular one is for the Elizabethan and there is another for the Viscount.

Pilots in the news—on the left, captain and co-pilot of a recent T.C.A. service from Toronto to Windsor were Capt. Arthur Hollinson and his son Armand. On the right, Airwork's Capt. M. R. Lacey, senior pilot in charge of training the new German airline Deutsche Flugdienst.

SIR ARCHIBALD HOPE STEPS DOWN

BECAUSE of "continuing restrictions on the activities of private airlines," Airwork's Sir Archibald Hope, O.B.E., D.F.C., B.A., has handed over his responsibilities as joint managing director to his colleague Mr. M. D. N. Wyatt, who until now has been the other joint managing director as well as chairman. It is clear that Airwork's operations, which have suffered repeated retrenchment in recent months, are no longer heavy enough to occupy the full-time efforts of two executive managing directors. It is good to know, however, that Sir Archibald's eleven years of air transport experience will not be lost to Airwork, on whose Board he will remain. He joined Airwork after demobilization from the Royal Air Force in 1945, becoming a director in 1951.

Notwithstanding Airwork's recent setbacks over their North Atlantic and continental cargo services, the company's Colonial Coach operations to Africa and the overseas trooping flights continue to operate at high capacity. A new enterprise—described in *Flight* of March 30th—is the initiation of the new German airline Deutsche Flugdienst (see the photograph above, right) into operational service.

BREVITIES

TWO Vickers Viscounts, it is reported from Manila, have been ordered by Philippine Air Lines. Delivery date is said to be 1957.

* * *

The Colombian airline Avianca says that it is giving "high priority" to the purchase of jet transports.

* * *

The airport of Kuwait will be taken over from the British Government by Kuwaiti authorities on June 30th.

* * *

Boeing 707 sales representation in Japan is to be handled by the Nissho Company of Osaka. This is the first time in its history that Boeing has had an outside sales representative.

* * *

A new air service connecting Leeds with Bristol and Exeter is to be started by Yeadon Aviation, Ltd. There will be one return flight weekly, timed for connections at Exeter to the Channel Islands.

* * *

An American air-taxi service, Taxi Air Group, Inc., of Toledo, Ohio, has just taken delivery of a D.H. Beaver and an Otter. The two Canadian-made transports will be used on a scheduled service (four return-trips daily) across Lake Erie between Detroit and Cleveland.

* * *

Gatwick racecourse has been bought by the M.T.C.A. for £248,850 under the Ministry's £6 million Gatwick Airport development plan. As reported in last week's *Flight* Gatwick is now closed and will remain so until work is completed in the spring of 1958.

* * *

Lufthansa's summer timetable includes three new Super-G services between Germany and the U.S.A., two of them *via* Manchester. Starting on April 23rd, the new flight—known as the "Manchester Mid-Western"—will be the first direct link between Britain's northern capital and Chicago.

* * *

A plea for more government assistance for the British independents was made on April 4th by Sir Frederick Handley Page. This and the re-equipment of Transport Command, urges Sir Frederick in his company's trading report, are necessary if British civil aircraft are to be produced in the quantities that will enable them to compete for overseas markets.

* * *

A two-week course of lectures on all aspects of air transport, arranged by the Royal Aeronautical Society, began at Christ Church, Oxford, on April 4th. The guest speakers are to include Lord Brabazon (who gave the opening address), Mr. Bo Bjorkman, of the Air Research Bureau; Mr. R. A. C. Brie, of B.E.A.'s helicopter unit; Mr. V. de Boursac, of A.I.T.A.; M. H. Bouche, I.C.A.O.; Prof. D. Goedhuis, professor of Air Law at Leyden University; Mr. Christopher Shawcross, Q.C., and Mr. B. S. Shenstone, B.E.A. The course ends on April 18th.

Over the Easter holiday about 4,000 people travelled between London and Paris on Skyways' coach-air-coach service.

* * *

The six S-55 helicopters now owned by Sabena are to be sold to the French Government, who will use them for military operations in Algeria. Sabena is now taking delivery of eight S-58s, which were ordered last autumn.

* * *

An expansion of Air Ceylon's services, which started last February with K.L.M. backing between London and Colombo, will begin on April 26th. The new service will be from Colombo to Bangkok.

* * *

Communist China's airline services now link 27 cities within the country, and connect directly with more than 30 other countries. The newest service is to Burma, linking Kunming and Mandalay with Rangoon.

* * *

For half-a-crown one may buy the new edition of the ABC publication *Civil Aircraft Markings*—a register for enthusiasts of every civil aircraft, British and foreign, likely to be seen in Britain. The majority of types are illustrated.

* * *

B.E.A. are discussing with Cambrian Airways the possibility of co-operation with that company in its West Country operations to ensure that Cambrian's routes feed more effectively into the B.E.A. network.

* * *

A Martin 4-0-4 of T.W.A. crashed on April 1st soon after taking off from Pittsburg. Of the 36 people on board 12 survived, including the pilot and co-pilot. On the same day a Stratocruiser of Northwest was ditched in the sea soon after take-off from Seattle. Thirty-three of the 37 occupants survived.

* * *

Canadian Pacific Air Lines will soon extend its services to Mexico (which it exchanged with T.C.A. last September for domestic routes in Ontario and Quebec). The new service will go to Buenos Aires, there being connections at Vancouver with C.P.A.'s polar flights from Europe, Hong Kong and Australia.

* * *

The official report of the accident on August 6th, 1955, to Anson G-AHIG of Fairways (Jersey), Ltd., concludes that lack of fuel was the cause, responsibility for which must rest with the pilot, Mr. Rudolf Nedoma. The aircraft was ditched in the Solent after both engines stopped. There was no loss of life.

* * *

Stockholm and Moscow will be linked later this year under the terms of an agreement recently signed between S.A.S. and Aeroflot in Moscow. Flights between the two capitals *via* Riga will be shared by the two airlines. This is the second air agreement between Russia and the West: Finnair began flights between Moscow and Helsinki in February.

INTRODUCING THE SAFARI

FINAL configuration and detailed performance estimates for the Frye F-1 DC-3 replacement have been announced by the Frye Corporation of Fort Worth, Texas. Known as the Safari, the machine is designed to carry twice the number of passengers or double the cargo load of a DC-3 at a lower unit cost. Previous news of the progress of the F-1 project was given in the September 23rd, 1955, October 7th, 1955, and March 23rd, 1956, issues of *Flight*.

The Safari will be offered in three main versions, for all-passenger, all-cargo, and combination cargo-passenger duties, each of which can be equipped with either retractable or fixed landing-gear. The basic powerplant will be the 600 h.p. Pratt and Whitney S1H1-G Wasp, while the Lycoming T53-L-1 turboprop (825 e.s.h.p.), Alvis Leonides Major (820 h.p.) and Wright R-1300 Cyclone (800 h.p.) are alternatives which can be fitted, without alteration to the nacelles aft of the firewall, for improved performance.

The passenger version will accommodate up to 51 persons in a main compartment 45ft 2in long, with 39in seat spacing. "The picture-window nose of this version," the company states, "will enclose a 'Vistaramic' lounge that gives passengers a forward look during flights." On average short-haul flights (75-600 miles), direct operating costs are estimated to be between 1.27 and 1.47 cents per seat-mile.

The freighter version will have an all-clear compartment 39ft 6in long by 9ft 1in floor width, providing a volume of 2,513 cu ft cargo space. It will have clamshell front doors giving an opening 106in × 75in in addition to a side door 76in × 75in, both with aircraft-floor level at truck-bed height. On a 1,000-mile flight the payload will be over 8,000 lb; over shorter distances, up to 12,000 lb can be carried at a direct operating cost of 10-11 cents per short ton-mile.

The normal configuration of the Safari (illustrated) will seat 25 passengers in the rear fuselage and will utilize the forward half for cargo. The passenger/freight proportion will be flexible, however, with the use of a movable bulkhead and modular seat-banks and overhead baggage units. Vistaramic lounge furnishings and windows, it is stated, are optional on this version. A fourth possible version of the basic F-1 is an executive/utility transport which, also, is flexible in its passenger/cargo proportions.

Artist's impression of the Frye F.1 Safari (cargo/passenger version powered by four P. and W. Wasps).

The flight deck and equipment compartment has a floor area of 130 sq ft, access being by means of a hatchway from the front of the main fuselage compartment. The Wasp powerplant installation incorporates an ejector cooling system which permits the use of low-drag nacelles.

The prototype Safari is expected to fly in February next year, with production deliveries starting in July.

PERFORMANCE DATA

Frye F-1 Safari powered by four 600 h.p. P. and W. Wasps

	At gross wt of 37,000 lb	At gross wt of 32500 lb
Useful cargo load	14,292 lb	9,792 lb
Take-off ground run	1,580ft	1,130ft
Distance to 50ft (four engines)	2,300ft	1,650ft
" " (one engine out, gear down)	2,800ft	1,940ft
Climb at normal rated power (sea level)	860 ft/min	1,090 ft/min
(8,000ft)	840 ft/min	1,070 ft/min
(15,000ft)	440 ft/min	650 ft/min
Time to 8,000ft	9.6 min	7.6 min
Service ceiling	21,000ft	24,300ft
Absolute ceiling	22,800ft	26,000ft
Level speed at normal rated power (sea level)	182 m.p.h.	185 m.p.h.
(8,000ft)	198 m.p.h.	201 m.p.h.
(15,000ft)	186 m.p.h.	192 m.p.h.
Level speed at cruise power (sea level)	160 m.p.h.	163 m.p.h.
(8,000ft)	171 m.p.h.	175 m.p.h.
(15,000ft)	169 m.p.h.	177 m.p.h.
Landing approach speed	81 m.p.h.	76 m.p.h.
Touchdown speed	62 m.p.h.	58 m.p.h.
Distance from 50ft	1,700ft	1,520ft
Ground run (non-reversing airscrew)	800ft	710ft

Dimensions: Span, 109ft 6in; length, 75ft 10in; height, 30ft 0in; wheelbase, 20ft 6in; track, 27ft 0in.

CLUB AND GLIDING NEWS

RESULTS of the first year's operations by the Vickers-Armstrongs, Ltd., (Weybridge) Flying Club have shown clearly how successful a works club can be with enthusiasm from members and an enlightened attitude from the company. A total number of 1,942 flying hours at Fair Oaks was logged by the club between April 1st, 1955, and March 31st last. On formation of the club, the company agreed to pay 90 per cent of the cost of flying, enabling members to fly at only 6s 6d per hour. Membership was limited to 60 during the year, and selection was by ballot because of the large number of applications. The original 60 members comprised 11 with current P.P.L.s, 4 with some previous flying experience and 45 with no previous experience. During the year 48 new licences have been obtained and two members have obtained night-flying ratings. Members have taken part in tea patrol, At Home and competition flying at Fair Oaks, and have begun aerobatic training and provided a fly-past on the company's sports day. A film of the club's activities has now been completed.

The first club year was necessarily an experiment—one which has proved so successful that it has been decided to train another 50 *ab initio* pupils and almost double the membership during the coming year. The continued popularity of the club is indicated by the present waiting list of no fewer than 160. With the continued generous support of the company, it is planned to increase markedly the number of hours flown this year.

"THE most staggering figures yet produced by any gliding club" claimed in a recent note from Wally Kahn, refer not to the result of another Lasham party but to the gliding activity there during the month of March. A total of 1,944 launches were made (of which 52 were by privately owned sailplanes), and 245 hours were flown, excluding 9 hr by private sailplanes. On Easter Monday 54 hours' thermal soaring were logged by 19 machines, and during the Easter weekend five pilots completed their "Silver C" five-hour duration legs over the South Downs at Cocking. Over 100 launches per day at Lasham is now a frequent occurrence. With a total club membership there of some 600, membership has now been restricted to experienced pilots. For *ab initio* pupils (apart from the instructional courses) a waiting list is in operation.

THE Easter rally organized by the Midland Gliding Club at the Long Mynd, Shropshire, was won by the Surrey Gliding Club's Weihe flown by David Martlew and John Williamson, which gained 231 points. Second was the Olympia IV flown by David Ince, with 203 pts, followed by Richard Prestwich in a Skylark II (198 pts) and Philip Wills in the Skylark III (194 pts). Among the long-distance cross-countries accomplished were goal flights in the Weihe by Martlew and Williamson respectively, to Cardiff (73 miles) and Abingdon (81), and an attempted goal flight to Dunstable (110) by Ince, who landed only four miles short.

FORTHCOMING EVENTS

Apr. 13. Helicopter Association: "Aerodynamic Aspects of Helicopter Design," by H. Roberts, Ph.D., B.Sc., D.I.C., A.F.R.Ae.S., A.M.I.Mech.E.
Apr. 14. Surrey Gliding Club: Annual General Meeting.
Apr. 14. London Gliding Club: Annual Dinner Dance.
Apr. 14. British Interplanetary Society (Birmingham): "Astronautics Today," by R. B. Beard, Grad.I.Mech.E., Grad.I.Prod.E.
Apr. 17. R.Ae.S.: Section Lecture: "Investigation of Aircraft Accidents," by E. L. Ripley, O.B.E.
Apr. 18. Institute of Navigation: "Relative Movement and the Collision Problem." An analysis by some of the technical committee members.
Apr. 18. R.Ae.S. Graduates and Students Section: "Gas Turbines—Propeller or Jet," by R. M. Fitzgerald.
Apr. 19. R.Ae.S.: Main Lecture: "High Speed Experimental Test Flying," by Lt-Col. Charles E. Yeager, U.S.A.F.
Apr. 21. British Interplanetary Society: Annual General Meeting.

R.Ae.S. Branch Fixtures (to April 19th):—

Apr. 13, *Birmingham*, "Prop-Jets in the Navy," by W. H. Lindsey. Apr. 14, *Southampton*, Annual Dance. Apr. 16, *Halton*, Brains Trust. Apr. 18, *Coventry*, A.G.M. and films; *Preston*, A.G.M. and film show; *Southampton*, "Full-Scale Layout," by J. W. Earle. Apr. 19, *Cheltenham*, A.G.M. and film; *Reading and District*, A.G.M. and film show

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

The Duke Visits No. 601 Sqn.

THE Duke of Edinburgh flew in his Heron to North Weald last Sunday to visit No. 601 (County of London) Sqn., R.Aux.A.F., of which he is Honorary Air Commodore. He flew from White Waltham with S/L. B. G. Stanbridge as co-pilot and F/L. G. C. Goodyer as navigator.

The Duke was received at North Weald by G/C. J. Rankin, the Station Commander, and by No. 601 Squadron's Commanding Officer, S/L. P. R. Edelston. He watched a fly-past, met pilots and ground officers, and inspected three Tiger Moths belonging to the squadron's flying club.

No. 16 Sqn. Standard

THE Duchess of Kent, on a tour of military units in Germany, presented a standard to No. 16 Sqn. at R.A.F. Celle last Friday. The weather was bad, and the ceremony, which was attended by German and allied guests, was held in a hangar. No. 16 Squadron was formed at St. Omer on February 10th, 1915, and has as its motto *Operta Aperta* ("Hidden Things are Revealed"), which referred to its rôle of tactical reconnaissance. The squadron is now equipped with Venoms.

Effects of the Pay Rises

THE largest increase in the rate of recruitment since the announcement of the new pay scales for the Services has been in the R.A.F. Between February 20th and March 24th, 1,579 men extended their engagement to 12 years; normally only 500 do so in the same period. Re-engagements to serve to a pensionable age rose from the average 280 to 1,125, many of them by men in advanced trades and by junior N.C.O.s. A further 1,285 men applied to re-enlist after leaving the R.A.F. No official figures are available for the other two Services at the time of writing.

Iraq Evacuation

ALL R.A.F. units have been evacuated from the bases at Habbaniyah and Shaiba, which have now been handed over to Iraq in accordance with the agreement signed on April 4th, 1955.

The Duchess of Kent presents the Standard to No. 16 Sqn. at R.A.F. Celle, Germany. Receiving it is F/O. D. Payne and G/C. K. J. Mellor is assisting. (See item on this page.)

"Medflex Dragon"

A MAJOR NATO sea and air exercise called "Medflex Dragon" is now in progress in the Mediterranean area. Naval and air forces from France, Italy, Great Britain, Greece, Turkey and the United States are taking part, together with Portuguese aircraft making their first appearance in a Mediterranean exercise. There is no specific strategic background and all phases are being treated as incidents in a war between Blue and Orange sides, with Blue as friendly. Initial engagements have been on a small scale, but from tomorrow all headquarters in the Command will be operating until the exercise ends on April 20th.

The exercise is being directed and the Blue forces commanded by Admiral Sir Guy Grantham, CINCAFMED, while sea forces of the Orange side will be commanded by their countries of origin.

A combined steam-past and fly-past of allied ships and aircraft will take place off Malta Grand Harbour on April 20th, in honour of Gen. A. M. Gruenther, SACEUR, who will be on board H.M.S. *Surprise*, flagship of Admiral Sir Guy Grantham.

Anniversary Concert

THE Queen and the Duke of Edinburgh attended the R.A.F. Anniversary Concert in the Albert Hall last Saturday evening. As detailed on this page on March 30th, there were some 750 performers in all, including the Hallé Orchestra and the Central Band of the R.A.F. Proceeds, totalling about £1,900, are to go to the R.A.F. Benevolent Fund.

More Boy-entrant Trades

BOY ENTRANTS between the ages of 15 and 16½ who wish to join the Service on leaving school will now have five new trade groups from which to choose. They are mechanical transport, supply, secretarial, general engineering and photography. A total of 1,150 such places will be available in the R.A.F. this summer.

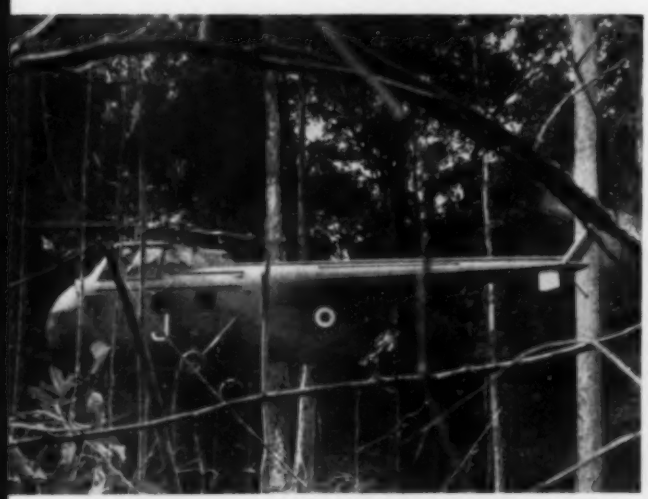
For 600 boy entrants there will be no preliminary examination, but there is an intelligence test. Aircraft apprentice vacancies number 550 and are open to those between 15 and 17½ who obtain a pass at ordinary level in mathematics and a science subject in the General Certificate of Education or its Scottish equivalent. Application for entry for aircraft apprentices must be made to the Air Ministry before May 14th, and for boy entrants before May 1st.

Aid from "Dam Busters" Film

THE sum of £10,000, part of the proceeds of collections in cinemas throughout the country during the showing of the film *Dam Busters*, has been given to the R.A.F. Foundationers' Trust at Christ's Hospital. The collections were made by permission of Associated British Cinemas, Ltd., and the Essoldo Circuit, Ltd.

The foundationerships were originally created in 1951 in memory of No. 617 Sqn. by a gift of £10,000 from Dr. Barnes Wallis, supplemented by a further £10,000 from the R.A.F. Benevolent Fund. Dr. Wallis was, of course, the inventor of the special bomb used to breach the dams.

At present three boys and one girl are being sent to Christ's Hospital each year. The latest gift to the trust will certainly allow this number to be maintained, and will possibly permit an increase.



This Whirlwind of No. 155 Sqn. has not had a jungle accident; it is hovering in a tiny clearing in the jungle in the Kluang district of Johore State. Special Air Service sticks drop down to prepare such clearings so that the Whirlwinds can bring in men and equipment for close-quarter operations against terrorists. This picture was taken by Capt. A. J. Grey of the Royal Hampshire Regiment.

SERVICE AVIATION . . .

Disarmament Post

IT is announced that A. Cdre A. A. Adams has been appointed the Chiefs of Staff Representative on Disarmament at the Ministry of Defence, for duty in connection with the United Nations Disarmament Sub-Committee, with the acting rank of air vice-marshal.

A. Cdre. Adams has most recently been air attaché at Bonn, Germany, and was before and after the outbreak of World War 2 Assistant Air Attaché in Berlin and Air Attaché at the Hague. During the war he commanded a bomber squadron and was an observer with the U.S. 5th Fleet during the recapture of Guam. He took the 1954 course at the Imperial Defence College.

R.A.F.A. Motor Rally

THE combined Royal Air Forces Association and B.A.R.C. night rally was held on 24th-25th March. Principal results were: *R.A.F.A. Premier Award*, O. Stirling (Sunbeam-Talbot), navigator B. Harracks, 26 marks lost; *R.A.F.A. Runner-up and Class Winner*, N. Dearnley (Alpine), navigator D. A. N. Osborne, 28 marks lost; *B.A.R.C. Winner*, H. Synge (Westminster), navigator J. Cawson, 127 marks lost; *Class Winners*, B. Wood (Zephyr), B.A.R.C., and D. Williams (Anglia), R.A.F.A.

Squadron Histories

SEVERAL squadrons now writing their histories or re-writing existing versions are asking for the assistance of ex-members and others in obtaining information, anecdotes and photographs. In all cases it is stated that material will be carefully treated and returned to the sender after copying if specifically requested.

The squadrons concerned, and their present addresses are: No. 15 Sqn., R.A.F. Honington, Suffolk; No. 109/105 Sqn., R.A.F. Binbrook, Lincs; No. 149 (East India) Sqn., R.A.F. Gutersloh, B.A.O.R. 39, Germany; No. 210 Sqn., R.A.F. Topcliffe, Thirsk, Yorks; No. 604 (County of Middlesex) Sqn., R.Aux.A.F., R.A.F. North Weald, Essex.

In each case material should be addressed to the squadron's adjutant.

Squadron Tie

A SILK tie with silver wolves' heads on a maroon background has been designed for No. 94 Sqn. and may be obtained, price £1, from the Adjutant, No. 94 Sqn., R.A.F. Celle, 2nd T.A.F., B.A.O.R. 23, Germany.

Royal Air Force Appointments

THE following continues a list of Royal Air Force appointments recently announced by the Air Ministry:—

G/C. R. I. K. Edwards, D.F.C., A.F.C., to R.A.F. Tangmere, to command; G/C. L. Fox, D.S.O., D.F.C., to H.Q. Fighter Command, for organization staff duties; G/C. J. E. Kirk, O.B.E., to R.A.F. Oakington, to command; G/C. O. A. Morris, D.S.O., to H.Q. Home Command, for administrative staff duties; G/C. J. W. Hunt, C.B.E., to Air Ministry for duty in the Department of the Air Member for Supply and Organization; G/C. J. M. N. Pike, D.S.O., D.F.C., to R.A.F. Kinloss, to command; G/C. S. N. Kettle, O.B.E., to H.Q., M.E.A.F., for administrative staff duties; G/C. L. M. Laws, to R.A.F. Church Fenton, to command; G/C. L. H. Snelling, A.F.C., to R.A.F. Hereford, to command; G/C. E. F. Wain, O.B.E., to H.Q., Technical Training Command, for administrative staff duties; G/C. L. Crocker, C.B.E., to H.Q., F.E.A.F., for technical staff duties.

G/C. R. F. L. Hart to H.Q., No. 24 Group, for administrative staff duties; G/C. C. G. Sharp to Air Ministry, for duty in the Department of the Air Member for Personnel; G/C. J. W. Bayley, M.B.E., to M.o.S.; G/C. R. B. Harrison, to Air Ministry, for duty in the Department of the Air Member for Supply and Organization; G/C. E. L. G. Le Dieu, C.B.E., to Air Ministry Unit, R.A.F., Ruislip, to command; G/C. R. C. Ayling, O.B.E., to R.A.F. Bassingbourn, to command; G/C. N. de W. Boult, D.F.C., A.F.C., to R.A.F. Acklington, to command; G/C. J. N. W. Farmer, D.F.C., to Air Ministry, for duty in the Department of the Chief of Air Staff; G/C. W. E. Rankin, C.B.E., D.S.O., to R.A.F. Feltwell, to command; G/C. R. J. Gosnell, D.S.O., D.F.C., to R.A.F. Wattisham, to command; G/C. J. Rankin, D.S.O., D.F.C., to R.A.F. North Weald, to command; G/C. D. C. Finlay, D.F.C., A.F.C., to Air Ministry, for duty in the Department of the Chief of Air Staff; G/C. F. S. Wakeham, to R.A.F. Halton, for administrative duties; G/C. E. G. Watkins, A.F.C., to R.A.F. Colerne, to command.

W/C. A. S. Baker, D.F.C., to Min. of Def.; W/C. R. J. Dempsey, D.F.C., to H.Q. Transport Command, for air staff duties; W/C. R. F. T. Doe, D.S.O., D.F.C., to Air Ministry, for duty in the Department of the Chief of Air Staff; W/C. G. W. Emeny, O.B.E., to R.A.F. Digby, for technical duties; W/C. P. G. D. Farr, O.B.E., D.F.C., to Air Ministry for duty in the Department of the Chief of Air Staff; W/C. W. B. Fleming, to R.A.F. Sutton-on-Hull, to command; W/C. K. C. Giddings, O.B.E., D.F.C., A.F.C., to R.A.F. West Raynham, for air staff duties; W/C. J. R. Musgrave, D.S.O., to R.A.F. Wittering, for flying duties; W/C. W. R. Owen, M.B.E., to R.A.F. Colerne, for technical duties; W/C. K. W. T. Pugh, A.F.C., to R.A.F. Waterbeach, for flying duties; W/C. F. E. Ratcliffe, O.B.E., to H.Q., A.A.F.N.E.

W/C. J. D. Richardson, to R.A.F. Kuala Lumpur, for technical duties; W/C. L. C. J. Smith, O.B.E., to H.Q., No. 66 Group, for administrative staff duties; W/C. G. J. Spence, to H.Q., A.A.F.C.E., for staff duties; Act. W/C. L. Ellerd-Styles, to H.Q., Bomber Command, for technical duties (with retention of acting rank of wing commander); W/C. L. M. Hodges, O.B.E., D.S.O., to R.A.F. Marham, to command (with the acting rank of group captain); W/C. F. C. Hopcroft, D.S.O., D.F.C., to Air Ministry, for duty in the Department of the Chief of Air Staff; W/C. J. T. Arklay, to R.A.F. Bruggen, for technical duties; W/C. D. N. Corbyn, to H.Q., Technical Training Command, for administrative staff duties; W/C. G. Craig, to R.A.F. Netheravon, for administrative duties; W/C. W. Cunliffe, O.B.E., to H.Q., Technical Training Command, for technical staff duties; W/C. C. G. Kimbrey, to Air Ministry, for duty in the Department of the Air Member for Supply and Organization; W/C. R. Martin, to H.Q., 64 Group, for administrative staff duties.

W/C. T. Phillips, to the R.A.F. Record Office, for administrative duties; W/C. H. R. E. Rumsey, to No. 3 Movements Unit (Embarkation), Liverpool, to command; W/C. H. A. F. Summers, to R.A.F. Gibraltar, for administrative duties; W/C. W. G. Clegg, O.B.E., to R.A.F. Faldingworth, to command; W/C. H. W. G. Andrews, D.F.C., to Air Ministry, for duty in the Department of the Chief of Air Staff; W/C. R. Berry, D.S.O., O.B.E., D.F.C., to R.A.F. Wittering, for flying duties; W/C. P. R. ap Ellis, to R.A.F. Weeton, to command the administration wing.

W/C. A. J. Goatly, to R.A.F. Honington, for administrative duties; W/C. L. H. Greenman, to Air Ministry, for duty in the Department of the Chief of Air Staff; W/C. W. W. Loxton, A.F.C., to H.Q., No. 63 Group, for air staff duties; W/C. J. R. Musgrave, D.S.O., to R.A.F. Marham, for flying duties (instead of to R.A.F. Wittering, as announced 10.2.56); W/C. K. P. Smales, D.S.O., D.F.C., to H.Q., 2nd T.A.F., for air staff duties; W/C. N. W. Turner, to Air Ministry, for duty in the Department of the Air Member for Supply and Organization; W/C. J. H. W. Freeman to S.H.A.P.E., for staff duties (retaining the acting rank of wing commander); Wg/O. I. D. Kingsley (W.R.A.F.), to H.Q., Home Command, for administrative staff duties; Wg/O. B. B. Parker (W.R.A.F.), to No. 31 School of W.R.A.F. Recruit Training, Wilmslow, to command; W/C. M. W. Palmer, to Air Ministry, for duty in the Department of the Air Member for Personnel (with acting rank of group captain).

W/C. E. S. R. Coakes, M.B.E., to M.o.S.; W/C. J. A. Cope, M.B.E., to H.Q., Bomber Command, for administrative staff duties; W/C. D. A. Garner, D.S.O., to H.Q., A.F.N.E., for staff duties; W/C. D. Iveson, D.S.O., D.F.C., to R.A.F. Gaydon, for flying duties; W/C. R. P. Norman, to Air Ministry, for duty in the Department of the Air Member for Supply and Organization; W/C. A. W. Oldroyd, D.F.C., A.F.C., to Air Ministry, for duty in the Department of the Chief of Air Staff; W/C. W. C. Ollason, D.S.O., D.F.C., to R.A.F. Biggin Hill, for administrative duties; W/C. T. C. Parker, O.B.E., to R.A.F. Waddington, for administrative duties; W/C. F. J. Walters, M.B.E., to No. 58 M.U., to command; W/C. D. R. S. Bevan-John, O.B.E., to R.A.F. St. Mawgan, to command (with acting rank of group captain); W/C. R. D. Elliott, O.B.E., D.F.C., to R.A.F. Leconfield, to command (with acting rank of group captain); W/C. G. G. N. Barrett, A.F.C., to H.Q., Coastal Command, for air staff duties; W/C. H. P. Burwood, to H.Q., Technical Training Command, for air staff duties; W/C. D. R. Griffiths, D.F.C., to H.Q., Caledonian Sector, for air staff duties; W/C. E. F. Hales, to R.A.F. Seletar (Singapore), for administrative duties; W/C. G. F. E. Loveridge, to H.Q., Allied Command Mediterranean, for staff duties; W/C. K. W. Mackenzie, D.F.C., A.F.C., to Air Ministry, for duty in the Department of the Chief of Air Staff; W/C. A. A. N. Nicholson to H.Q., No. 1 Group, for air staff duties; W/C. E. J. Ryder, to Air Ministry, for duty in the Department of the Chief of Air Staff; W/C. J. R. St. John, D.S.O., D.F.C., to H.Q., Bomber Command, for air staff duties; W/C. F. M. Thomas, to R.A.F. Filton, to command; W/C. E. J. Brandon, to the British Joint Services Mission, Washington, for technical duties; W/C. R. T. W. Evans, M.B.E., to Air Ministry, for duty in the Department of the Air Member for Supply and Organization.

Seven Avon Sabres, the first to reach a front-line R.A.A.F. squadron, fly over Melbourne. The new squadron is No. 3, part of No. 78 Fighter Wing, based at Williamtown, N.S.W. It celebrated its formation by flying over Sydney, Canberra and Melbourne. The other two squadrons in the Wing, Nos. 75 and 77, will be re-equipped by the end of the year, and two units will then go to R.A.F. Butterworth, in Malaya.

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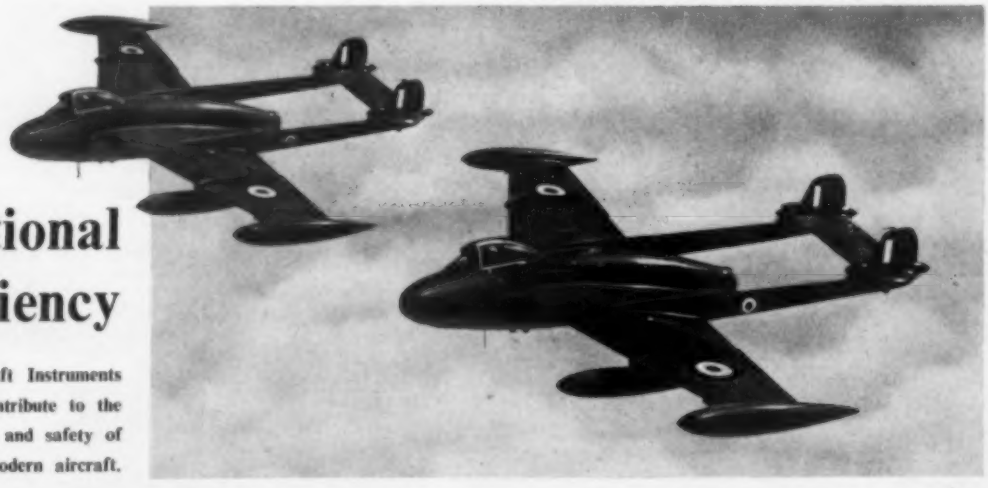

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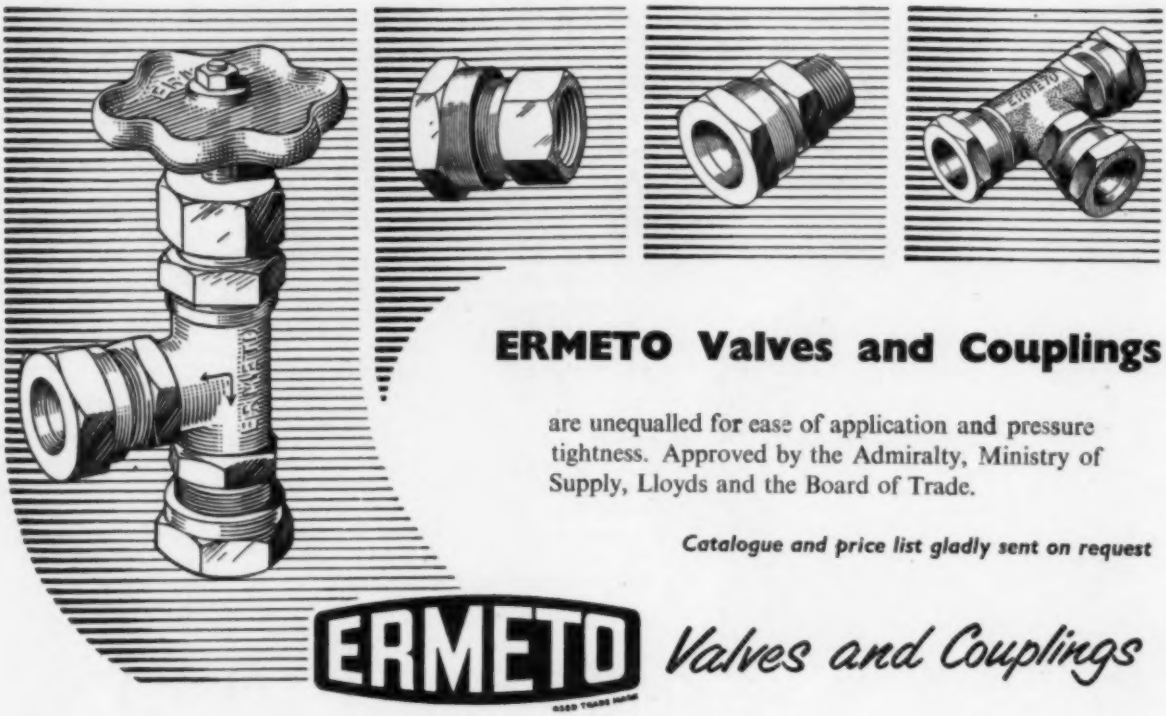

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PULLIN INSTRUMENTS IN ACTION . . . NUMBER THREE

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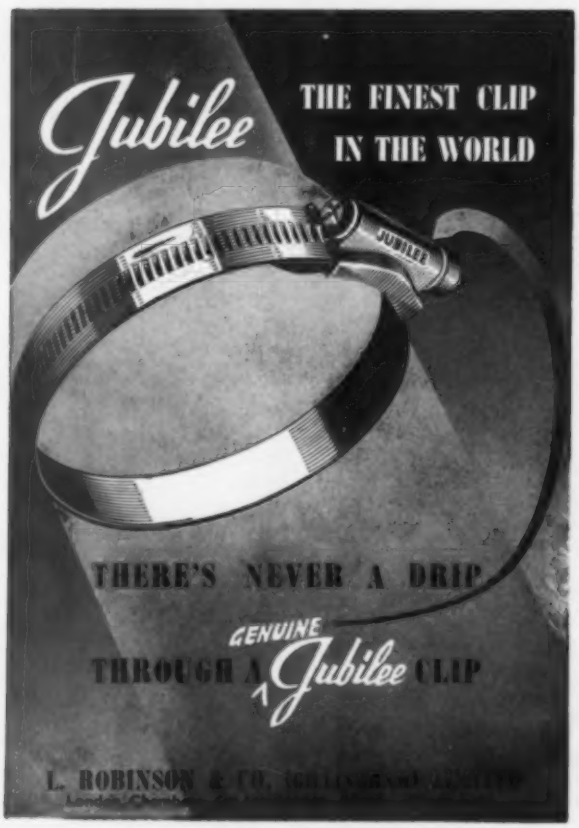

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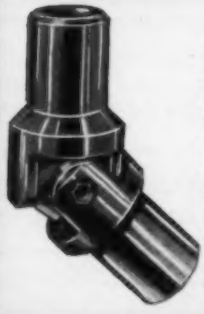

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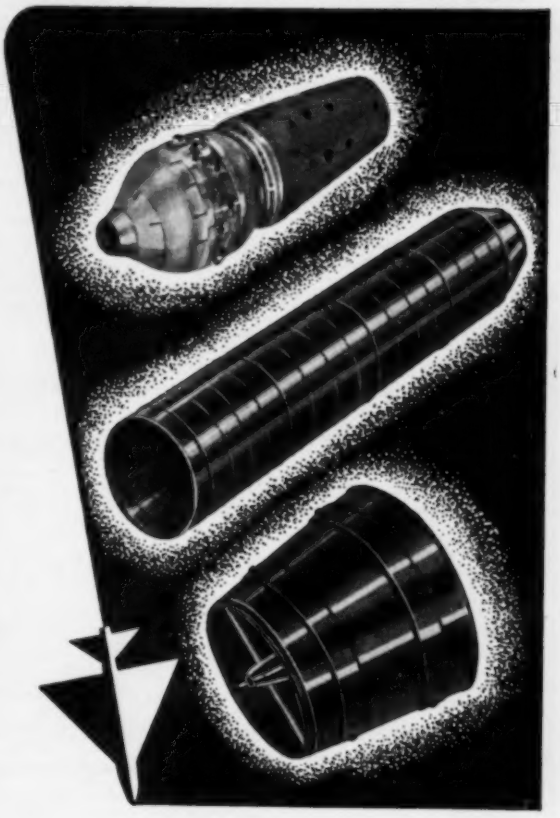

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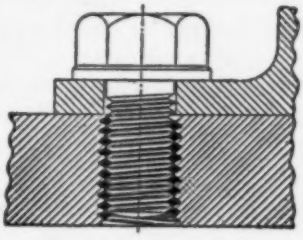

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THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:

FROM East Anglian Flying Services, Ltd., of Southend Airport, Southend-on-Sea, Essex:

APPLICATION No. 452/1 for an amendment to the terms of approval of the Normal Scheduled Service which they are authorised to operate during the period up to July, 1962, on the route Ipswich and/or Southend-Rotterdam and/or Ypenburg at a frequency of 30 return flights per week, so as also to operate on the route London (Croydon or Gatwick) and/or Southend-Rotterdam with D.H. Dove, D.H. Heron or Dakota aircraft.

APPLICATION No. 768. For a Normal Scheduled Service initially with D.H. Dove aircraft and later possibly with D.H. Heron and/or Prestwick Pioneer II and/or Dakota aircraft for the carriage of passengers, supplementary freight and mail on the route Birmingham-Southend (optional stop)—Rotterdam with the right to operate terminating flights on all sectors at a frequency of seven to 21 return flights weekly during the period from 1st April, 1957 to 31st March, 1967.

APPLICATION No. 767. From Eagle Aviation, Ltd., of 29, Clarges Street, London, W.1, for a Normal Scheduled Service with Viking and Dakota aircraft and later possibly with Viscount aircraft for the carriage of passengers, supplementary freight and mail between Manchester (Ringway) and Luxembourg (Findel) and/or Basle at a frequency of seven return flights weekly for a period of 10 years, commencing from date of approval.

APPLICATION No. 769. From British European Airways Corporation of Keyline House, Ruislip, Middlesex, for a Helicopter Service with S.55 Helicopter aircraft for the carriage of passengers, supplementary freight and mail between Nottingham Town and/or Leicester City and Birmingham (Elmdon) at an initial frequency of up to three return flights daily increasing further according to traffic demand for a period of 10 years commencing 1st July, 1956.

APPLICATIONS Nos. 743 and 757 inclusive from Eagle Aviation, Ltd., of 29 Clarges Street, London, W.1. The frequency stated in these applications for Inclusive Tour Services in conjunction with Sir Henry Lunn, Ltd., should be amended to read "seven return flights weekly".

APPLICATION No. 43/5. From Airwork, Ltd., of 15, Chesterfield Street, London, W.1, for an amendment to the terms of approval of the Colonial Coach Services which they are authorised to operate with Viking aircraft between London and N'dola, Lusaka and Salisbury and between London and Wadi Halfa, Khartoum, Juba, Entebbe and Nairobi, in each case through Malta with traffic rights between Malta and traffic points to the South, so as to be permitted in future to carry also up to 30 passengers in all in each period of 28 days between London and Malta.

APPLICATION No. 18/4. From Hunting-Clan Air Transport, Ltd., of 72, Wigmore Street, London, W.1, for an amendment to the terms of approval of the Colonial Coach services which they are authorised to operate with Viking aircraft between London and N'dola, Lusaka and Salisbury and between London and Wadi Halfa, Khartoum, Juba, Entebbe and Nairobi, in each case through Malta with traffic rights between Malta and traffic points to the South, so as to be permitted in future to carry also up to 30 passengers in all in each period of 28 days between London and Malta.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3, Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they were applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [5095

THE

LOCKHEED HYDRAULIC BRAKE
CO. LTD.

LEAMINGTON SPA

is prepared to train a number of young men (aged 22 to 28) with suitable technical and practical engineering backgrounds for responsible positions in the field of Work Study.

The Company operates a progressive policy for staff training and promotion and offers attractive salaries during training period.

Applications, giving full details of age, qualifications and experience should be submitted to the

Personnel Officer,
Lockheed Hydraulic Brake Co., Ltd.,
Tachbrook Road,
Leamington Spa, Warwicks.

STRESSMEN

Vacancies exist for senior and intermediate Stressmen with sound aeronautical experience to join progressive and rapidly expanding organisation.

Applicants must have completed National Service and have high degree of enterprise and initiative.

Good salaries will be paid in accordance with ability and experience.

Write:
Chief Draughtsman,
Microcell, Ltd., 56 Kingsway, W.C.2.

VICKERS-ARMSTRONGS
(AIRCRAFT) LIMITED,
WEYBRIDGE, SURREY,

have Vacancies on After Sales Service for

(x) **AIRCRAFT SERVICING ENGINEERS (Airframe)** with "A" licences preferably endorsed for Viking or four-engined aircraft: for representative work on Viscount aircraft overseas, after gaining the necessary experience at Weybridge.

(y) **TECHNICAL LIAISON ENGINEERS (Airframe and Electrical)** in the Civil Aircraft Service Department. Applicants should be well educated, including an apprenticeship or similar training, and have had some experience on aircraft design.

Applications, quoting date and prefix letter of advertisement to:

Employment Manager,
Vickers-Armstrongs (Aircraft) Limited,
Weybridge.

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

DESIGNERS AND TECHNICIANS

Present and long term future commitments necessitate considerable increase in our Technical Staff. Staff is required in the following departments:

DRAWING OFFICE

STRESS OFFICE

AERODYNAMICS

MATHEMATICAL
(computing)

FLIGHT TEST

WIND TUNNEL

TEST LABORATORIES
(Mechanical and Electronic)

These jobs are permanent for suitable people and offer every opportunity for advancement. Working conditions and rates of pay are excellent.
Write to:

The Chief Designer,
Blackburn & General Aircraft, Ltd.,
Brough, E. Yorks.

Please state if you prefer our Brough, London or Leeds Design Offices. [5022

CHIEF RATEFIXER REQUIRED

For a large aircraft company situated on south coast.
Only men with previous aircraft experience and who have held similar position, considered.
Write, giving details of past experience and salary required to Box A.C. 17005, Samson Clarks, 57-61 Mortimer St., W.1. [5076

OPPORTUNITIES FOR RESEARCH

SIR GEORGE GODFREY AND PARTNERS, LTD.

have an interesting long-term research programme associated with the cooling of high-altitude, supersonic aircraft and guided weapons.

To support these activities extensive research plant is being made available to study problems associated with insulation and cooling of equipment up to extreme altitudes.

Our Company, pioneers in this field, have found it necessary to expand their existing research facilities thereby creating these opportunities.

Qualified Engineers with experience in this or heat transfer or Gas Turbine or Vapour Thermodynamics are required to control specialised investigations and are asked to apply to the

Personnel Officer,
Sir George Godfrey & Partners, Ltd.,
Hampton Road West,
Hanworth, Middlesex,

for these pensionable positions, giving full details of experience.

SITUATIONS VACANT

ULTRA ELECTRIC, LTD.,

Western Avenue, Acton, London, W.3.

DRAWING OFFICE STAFF

THE rapid expansion of our Aircraft Accessories Division has given rise to the following vacancies:
(a) SENIOR DESIGNERS, experienced in light mechanical engineering, including electro-mechanical engineering, capable of basic thought and leading a design development team.
(b) DESIGN DRAUGHTSMEN, capable of developing basic designs for production.
(c) DESIGN DRAUGHTSMEN, with experience in the mechanical aspects of chassis layout and mechanical devices for M.o.S. test equipment.
(d) CHECKERS (preferably over 30 years of age), with experience of checking light engineering work for production.
(e) JIG & TOOL DRAUGHTSMEN, with experience of press tools, assembly fixtures and general jig and tool work.
GOOD salaries will be offered. Pensions and Insurance Scheme. First-class working conditions and facilities.
SATURDAY morning interviews arranged.
PLEASE write or telephone (ACORN 3434) The Personnel Manager. [5092

A FULL and interesting programme of advanced design is being undertaken by our

LONDON DESIGN DEPARTMENT

at 37 Queen Square, W.C.1.
There are vacancies for Senior, Intermediate and Junior Draughtsmen with experience of aircraft design, and applications from Draughtsmen and Draughtswomen without such experience will also be given careful consideration.
Numerous advantages can be offered to those joining this expanding organisation, including good prospects of promotion, really worthwhile salaries and the opportunity to become members of an enthusiastic and friendly group, working in a pleasant modern office.
Applications, giving details of age, experience, etc., and quoting ref. F.80, should be addressed to the Personnel Officer, Saunders-Roe, Limited, 37 Queen Square, London, W.C.1.
(Weekend interviews will be arranged in London.) [5042

THE
DE HAVILLAND ENGINE COMPANY
LIMITED

Makers of the
"Super Sprite" and "Spectre" Rocket Engines

have vacancies in their fast expanding

ROCKET DIVISION

If you are a first class:

DESIGNER
DETAIL DESIGNER
CHECKER, TRACER
or
DEVELOPMENT ENGINEER

and would like to discuss your prospects with us, either write to:

The Personnel Officer,
THE DE HAVILLAND ENGINE COMPANY LIMITED
STAG LANE, EDGWARE, MIDDLESEX

or call any Saturday morning between 10 o'clock and 12 noon—No appointment is necessary.

Here is your opportunity to obtain an interesting, well paid and progressive job on projects of National importance.

BRISTOL AIRCRAFT LIMITED

requires a number of

AIRFRAME SPARES SCHEDULE COMPILERS

for their

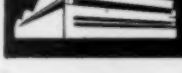
TECHNICAL PUBLICATIONS DEPARTMENT

●

Applications from Ex-Service Officers with suitable experience will be particularly welcome

●

Write, quoting D.O.J.F.61, and giving details of age, qualifications, experience and present salary, to the Personnel Manager, Bristol Aircraft Ltd., Filton House, Bristol



THE GUIDED WEAPON FLIGHT TRIALS DIVISION

has vacancies for the following staff:

1. SENIOR ENGINEER

Experienced electronic engineer required to take charge of a small laboratory team engaged in telemetry circuit design.

Applicants should be aged 28-35 years and hold an engineering degree, H.N.C. or C & G. full Technological Certificate.

Original and interesting work for a man with technical initiative.

2. ENGINEERING ASSISTANTS

Young men with 2-3 years electronic laboratory experience are required to build up the telemetry development staff.

These posts offer opportunities for original circuit development, prototype engineering and the application of advanced airborne and ground equipment.

Applicants should be aged 24-28 years and hold qualifications equivalent to H.N.C. or C. & G. Final Certificate.

3. TEST EQUIPMENT ENGINEERING ASSISTANTS

Vacancies exist for a small number of electronic engineers, with a wide practical background, to work on maintenance of highly specialised test equipment, both in the U.K. and Australia.

Applicants should be aged 20-30 years and hold O.N.C. or equivalent and have had at least 2 years electronic laboratory or equivalent Service experience.

Please write, giving full details of age, qualifications held and previous experience, quoting Ref. 123, to:

THE PERSONNEL MANAGER (TECHNICAL EMPLOYMENT), DE HAVILLAND PROPELLERS, LIMITED, HATFIELD, HERTS.

GLOSTER AIRCRAFT CO. LTD.

GLOUCESTER

HAVE VACANCIES ON SUPER-PRIORITY DESIGN AND DEVELOPMENT PROJECTS FOR

AIRCRAFT DESIGN DRAUGHTSMEN

(SENIOR AND JUNIOR)

Consideration will also be given to Draughtsmen with Mechanical, Structural or Electrical Experience.

STRESSMEN

(SENIOR AND INTERMEDIATE)

for both strength and flutter calculations.

WEIGHT ENGINEERS

(SENIOR AND JUNIOR)

The conditions of employment are good with progressive salary, good sports and welfare facilities, pension scheme, etc.

APPLICATIONS STATING AGE, PREVIOUS EXPERIENCE AND EMPLOYERS, SHOULD BE ADDRESSED TO THE

CHIEF DESIGNER

SITUATIONS VACANT

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED, WEYBRIDGE

In an expanding field of Electrical and Electronic Engineering in aircraft, which provides interesting opportunities to those with ability, have vacancies for:—

(c) ELECTRICAL AND RADIO ENGINEERS (Senior and Junior), with the appropriate Higher National Certificate or an equivalent, for work on system development, etc.

(d) ELECTRICAL AND RADIO DRAUGHTSMEN, with preferably not less than the appropriate Ordinary National Certificate or some equivalent.

(e) RADIO LABORATORY ASSISTANTS for test and development of communication equipment, auto pilots, etc.

Previous aircraft experience and Associate Fellowship of the Royal Aeronautical Society are both an advantage.

Applications, quoting date and prefix letter of advertisement to: Employment Manager, Vickers-Armstrongs (Aircraft), Limited, Weybridge, Surrey. [5075

ELLIOTT BROS. (LONDON), LTD., AIRPORT WORKS, ROCHESTER, KENT

(AVIATION DIVISION)

CHIEF INSPECTOR is required to take control of entire Inspection of the Aviation Division.

THIS Division produces both electrical and mechanical aircraft instruments of a high precision nature and experience of this or similar works is required.

THE successful candidate will be qualified in either electrical or mechanical engineering. He will have had administrative experience on Inspection, and preferably with A.I.D. or/and A.R.B. approval.

APPLICATIONS, giving full details of age, experience and qualifications and salary required, etc., to Personnel Officer at the above address. [5080

MANAGEMENT TRAINEES

LARGE, expanding, light engineering Company in South Midlands is prepared to engage selected number of Young Men (23-30) for training through technical work, foremanship and on eventually to Managerial posts. Qualifications required:—

(i) Secondary Grammar School Education.
(ii) H.N.C. standard in Mechanical Engineering.
(iii) Five-year Apprenticeship in reputable engineering firm or equivalent experience.

APPLICANTS must be prepared for factory hours during training (including night shift if necessary) and to work hard for a number of years to fit themselves for the higher posts in engineering industry. Apply in own writing, giving age, qualifications, present salary and career to date in chronological order. Box No. 1034. [5093

FEDERATION OF RHODESIA AND NYASALAND

Vacancies: Junior Meteorological Officers. Department of Meteorological Services.

APPLICANTS, under 27, must hold the School Certificate or G.C.E. with at least four subjects at "O" level obtained at the same examination and have had a minimum of four years' experience in meteorological duties.

STARTING SALARY: £540—£840, depending on quals. and experience, on scale rising to £1,100. Senior Posts, with salaries up to £1,730 p.a., are filled by internal promotion.

APPLICATION forms and further details from the Federal Public Service Attaché, Rhodesia House, 429, Strand, London, W.C.2. Closing date 30th April, 1956. [5064

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED, WEYBRIDGE,

have vacancies for:

(a) PLANNING ENGINEERS with experience on jig and tool control. Applicants must have a sound practical knowledge and be up-to-date on both jig and tooling methods.

(b) TECHNICAL CLERKS, with some knowledge of jig and tool engineering, to assist the above Planning Engineers.

Applications, quoting date and prefix letter of advertisement to: Employment Manager, Vickers-Armstrongs (Aircraft), Limited, Weybridge, Surrey. [5079

DESIGNERS. First-class senior designers are required for interesting work on the design of gas turbine fuel systems and controls. These appointments offer excellent opportunities to the right individuals but only first-class senior designers need apply. Applications to be sent to Personnel Manager, Joseph Lucas (Gas Turbine Equipment), Ltd., Shaftmoor Lane, Hall Green, Birmingham, 28. [5035

SITUATIONS VACANT

VICKERS-ARMSTRONGS (AIRCRAFT)

LIMITED, HURN DEPOT,

NR. BOURNEMOUTH

Engaged on the production of Viscount aircraft have immediate vacancies for:—

(f) DESIGN DRAUGHTSMEN (of all grades) for work on structures, power plants, installations, mechanisms, furnishing, electrical and radio systems. Aircraft experience not essential.

Applications, quoting date and prefix letter of advertisement to: Employment Manager, Vickers-Armstrongs (Aircraft), Limited, Hurn Depot, nr. Bournemouth, Hants. [5078

AIR TRAINERS LIMITED,

Bicester Road, Aylesbury,

Have vacancies in the New Factory for:—

MECHANICAL DESIGNERS

for interesting work on Mechanical Computors.

Apply:

PERSONNEL MANAGER [5077

HELICOPTER ENGINEERS

APPLICATIONS are invited from Engineers holding "A" and "C" licences on Westland S.55 Helicopters who would be interested in employment with a prominent British Whaling Company's Antarctic floating factory expeditions, departing each year October, returning April/May. Attractive terms include good salary and two months' paid holiday each summer. Applications with full particulars to Chr. Salvesen & Company, 29 Bernard Street, Leith. [5081

AIR Traffic Controller required. Apply Bembridge Airport, Isle of Wight. [5066

DAKOTA First Officer required. Group 11 endorsement and Instrument Rating. B.A.L.P.A. rates plus good bonus. Box No. 0986. [5074

ARMSTRONG SIDDELEY MOTORS, Coventry, require an Assistant Technical Engineer for project work. This is a unique opportunity for a young man with some technical qualifications to enter the most interesting side of the gas turbine field. The position gives full scope for technical ability, entailing investigations and design calculations on many advanced and challenging projects. Applications with full details of age, qualifications and experience, if any, to the Technical Personnel Manager, Armstrong Siddeley Motors, Coventry, quoting 'Projects 1.' [0464

ASSISTANT Chief Stressman required for urgent programme of development of super priority. This is an excellent opportunity for a first-class structures man having degree and several years' aircraft stressing experience.

IDEAL conditions and first-class pension scheme with free life assurance. Write in confidence with full details to.—Chief Designer, Helliwells, Ltd., Elmdon Airport, Birmingham, 26. [4986

JUNIOR Detail Draughtsman required for Aircraft Component Development. Aircraft experience preferred but not essential. Reply in writing to: King Aircraft Corporation, Fifth Street, Montrose Ave., Hillington, Glasgow, S.W.2. [0421

CANADIAN firm requires technicians with experience on American type aircraft. Preferably single. Apply Chief Engineer, giving details, qualifications, Allied Aviation Company, Gander, Newfoundland. [5040

SENIOR qualified development engineers and technicians required in research department of a well-known firm of precision engineers, particularly for work in connection with Servo systems, small precision motors and gyroscopic control systems. Apply stating age, qualifications, experience, and salary required to S. G. Brown, Ltd., Shakespeare Street, Watford, Herts. [0146

REQUIRED for service with B.I.A.L. in Beirut, one Radio Officer and three Flight Engineers on Hermes aircraft. Good pay and allowances. Apply Staff Manager, A.B.A. (ME), Ltd., Stratton House, Stratton St., W.1. [5082

AIRCRAFT Industry. Large Manufacturers connected with the Aircraft Industry require Representative in a senior capacity. Applicants should have the necessary contacts at top level in the Industry, with a knowledge of blade manufacture and design. Good remuneration and prospects to suitable applicant, age 30/50. Please give full details of experience, education, age and remuneration envisaged to Secretary, Box No. 1002. [5087

ARMSTRONG SIDDELEY has a vacancy for a flight test observer in connection with flight testing gas turbine engines. Applicants should have a Degree or equivalent in either Mech. or Aeronautical Engineering. Previous flying experience not necessary. Selected applicants will be required to undergo a medical examination. Good salary offered dependent on age, experience and qualifications. Applications to Reference FL/T, Armstrong Siddeley Motors, Coventry. [0463

WANTED, draughtsmen to design in aluminium for sales development. Must possess Higher National Certificate in Mechanical Engineering. Location Banbury. Good working conditions and pleasant surroundings. Attractive starting salaries offered up to £800 p.a. with prospects of promotion from drawing board. Pension plan in operation. Send brief details of qualifications and experience to Northern Aluminium Co., Ltd., Bush House, Aldwych, London, W.2. [0348

SCOTTISH AVIATION have immediate vacancies for aircraft stressmen and aerodynamicists for work on the Prestwick Twin Pioneer aircraft. Excellent prospects for experienced men. New houses are also immediately available. Applicants should reply in writing giving details of experience and training to the Personnel Manager, Scottish Aviation, Limited, Prestwick Airport, Ayrshire. [4911

SCOTTISH AVIATION urgently require Planning Engineers for work on their Prestwick Twin Pioneer project. Applicants should have served a recognised Engineering Apprenticeship and have previous Aircraft Planning experience. Houses immediately available. Reply giving details of training and experience to Personnel Manager, Scottish Aviation, Ltd., Prestwick Airport, Ayrshire. [4858

WIND TUNNEL MODEL DESIGNER. A vacancy exists for an experienced Wind Tunnel Model Designer, to be attached to the Aerodynamic Section, Weapons Research Division, A. V. Roe & Co., Ltd., Woodford, Cheshire. This is a new position, and the successful applicant will be responsible for the design of models for many of the country's Tunnel facilities, and for liaison with the test establishments on the progress and manufacture of the models.

LETTERS should be addressed to the Chief Designer. [5067

ROCKET Division of Armstrong Siddeley Motors has really good vacancies for designers and draughtsmen intent on furthering their career in this new branch of propulsion. Applicants must have had minimum of three years drawing office experience and preferably hold at least a Higher National Certificate in Mechanical Engineering. Drawing Office experience however is preferable to academic qualifications. Due to new projects and consequent expansion of department prospects for men of the right calibre are unusually good. This is a fine opportunity to enter on the ground floor of new and fascinating work with far reaching implications. Initial salary range £13 10s. to £16 10s. per week. Apply for a personal interview with our Chief Designer, Rocket Division, by writing to Technical Personnel Manager, Armstrong Siddeley Motors, Coventry, quoting reference RD/DD. [0469

OPPORTUNITIES in Helicopter Research and Development at Ministry of Supply, Aeroplane and Armament Experimental Establishment, Boscombe Down, nr. Amesbury, Wilts. Duties may include theoretical research, flight research and testing, or instrument research and development. Candidates should have a 1st or 2nd class honours degree or equivalent in Engineering, Mathematics or Physics. Previous experience on Helicopters desirable but not essential. Appointments according to age, experience, etc., as Senior Scientific Officer (min. age 26 with at least 3 years post graduate research experience) or Scientific Officer (min. age 21). Salary within ranges, S.S.O. £1,030—£1,185: S.O. £488 10s.—£885 (Superannuable). Houses become available for married staff. Application forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting C293/6A closing date 5 May, 1956. [5094

SENIOR PROJECT ENGINEERS

LOCKHEED HYDRAULIC BRAKE CO. LTD.
LEAMINGTON SPA

Have a number of vacancies for

SENIOR PROJECT ENGINEERS

Applicants should possess an Engineering degree or be eligible for membership of a recognised engineering institution and have had about 5 years' engineering experience, preferably in the automobile field. In addition they must have drive, initiative, a flair for original design, and the ability to direct the requirements of development testing. These are Senior appointments and the commencing salary will be commensurate with experience and qualifications.

Applications in strictest confidence, should give full details of qualifications, experience and positions held, with salary, to:—

Personnel Officer,
Lockheed Hydraulic Brake Co., Ltd.,
Tachbrook Road,
Leamington Spa, Warwickshire.

AVRO

A. V. ROE & CO., LIMITED

(AIRCRAFT CONSTRUCTORS)

GREENGATE, MIDDLETON, MANCHESTER

have vacancies on Super-Priority Design and Development Projects for

DESIGN DRAUGHTSMEN

(SENIOR AND JUNIOR)

Applications are invited from individuals having Aircraft, Mechanical, Structural or Electrical experience.

Salaries will be arranged according to experience and ability.

Applications will be treated in strict confidence and should be addressed, in the first place, quoting Ref. PM/1 to:

The Personnel Manager, A. V. Roe & Co., Limited,
Greengate, Middleton, Manchester.

SITUATIONS VACANT

PILOT required for Auster photographic work. Permanent congenial position. Skyfotos, Lympne Airport, Kent. [5068

TEST and Laboratory Engineers required for gyro and electro mechanical instruments. Apply stating age, experience and salary required to S. G. Brown, Ltd., Shakespeare Street, Watford, Herts. [0147

DRAUGHTSWOMAN required by Aircraft Equipment Company in South Bucks. Salary, according to age and experience, up to £13 per week. Apply to Box No. 1001, c/o Flight. [5085

SENIOR Design Draughtsman, accustomed to working with the minimum of supervision, required for Aircraft Component Department. Aircraft experience preferable but not essential. Salary in accordance with experience and qualifications. Reply in writing to: King Aircraft Corporation, Fifth Street, Montrose Ave., Hillington, Glasgow, S.W.2. [0420

KING AIRCRAFT CORPORATION require Senior, Intermediate and Junior Draughtsmen, and Stress Engineers, at their Central Glasgow Design Offices for work on an expanding programme of interesting and important projects of an advanced nature. Good salaries and conditions. Forward details of previous experience to:—Personnel Officer, King Aircraft Corporation, Hillington, Glasgow, S.W.2. [0422

LICENSED Ground Engineer required to take charge of aircraft on small flying school and repair section. Minimum requirements A & C Licence, B advantage. Good prospects for applicant with initiative. Apply Goodhew Aviation Company Limited, Oxford Airport, Kidlington, Oxford. Tel.: Kidlington 3355/7. [5065

MANUFACTURERS of gas turbine engines have vacancies for Mechanical Engineering Draughtsmen interested in Installation Design. Ordinary National Certificate or Higher National Certificate in Mechanical Engineering an advantage although not essential. Age limits 19 to 28. Positions hold good prospects for young men willing to learn and work hard, with commensurate salaries and pension scheme. Apply to Reference Installation/2, Box No. 8528. [0462

ARMSTRONG SIDDELEY MOTORS have a vacancy for an Honours Degree Mathematician in an expanding section, using electronic calculating machines for the solution of all types of problems associated with the evelopment of gas turbine aero engines. Experience is not necessary but would be taken into account in fixing the initial salary. Applications with full details should be submitted to Reference DRE, Technical Personnel Officer, Armstrong Siddeley Motors, Coventry. [0460

WANTED—Bush Pilot for West Africa. Minimum qualifications senior commercial and instrument rating. 1,000 command hours. Beaver experience an advantage. Apply Chief Pilot, Hunting-Clan Air Transport, Ltd., London Airport, Hounslow, Middx. [5097

GRADUATES in Science or Engineering for development work on gas turbine fuel systems for aircraft and commercial projects. Training will be given if required to personnel newly qualified. These vacancies are pensionable and offer opportunities for individuals to progress to senior appointments in a new and rapidly expanding company. Applications should be made to the Personnel Manager, Joseph Lucas (Gas Turbine Equipment), Ltd., Shaftmoor Lane, Hall Green, Birmingham, 28. [5034

HANDLEY PAGE (READING) LIMITED, The Aerodrome Woodley, Reading, Berks, have vacancies for Senior Stressmen for interesting work on Civil Aircraft. High commencing salaries will be paid and new houses to rent will be offered to successful applicants. Also required are Senior and Intermediate Design Draughtsmen and Weights Engineers. Superannuation and Life Assurance Scheme is in operation for all staff employees. Please send full particulars of experience, etc., to the Personnel Officer. [0280

GUIDED MISSILES

A Senior Engineer is required by an important Company, engaged on major guided missile projects, to take charge of work associated with the flight trials of these weapons.

The main responsibilities of this post are to co-ordinate the work of a large group of technicians engaged on this task; the work is of a very interesting and varied character, and covers overall system testing and the analysis and the behaviour of installations covering mechanical, hydraulic, electronic and electrical engineering.

A University Degree or its equivalent is required in one of the following branches of engineering:—

Servo-control systems, Electronic and Electrical Engineering, Radar, radio and telecommunications.

The salary scale will be commensurate with the high degree of responsibility associated with this Senior post, and the successful applicant will be eligible for the Company's attractive Superannuation Scheme.

All replies should be addressed to:—

TECHNICAL APPOINTMENTS OFFICER,
BOX No. 1019, c/o FLIGHT, QUOTING REFERENCE L/4.

Senior Staff posts for ambitious men !

JOSEPH LUCAS LIMITED, BURNLEY

Manufacturers of Aircraft and Motor Equipment require the following technicians to assist in the work of Gas Turbine development :

A

MATHEMATICIAN

Applicants should possess a B.Sc.(Maths.) degree

A

PERFORMANCE ENGINEER

who should hold a B.Sc.(Eng.) degree

A

COMBUSTION OR HEAT TRANSFER ENGINEER

who possesses either a B.Sc. (Eng.) degree or an A.M.I.Mech.E., and has experience of heat exchanges and fundamental heat transfer.

Here is an opportunity to work with a progressive Company on Gas Turbines that power the most modern Aircraft. High salaries to the right men. An assured future and a generous Pension Scheme.

Apply by letter to The Personnel Manager, Hargher Clough Works, Burnley, Lancashire

D. NAPIER & SON, LTD.

Technical Publications Department

A large engineering group producing a wide range of instructional, sales, publicity and prestige publications on internal combustion engines and mechanical and electrical products requires following staff :

TECHNICAL AUTHORS and ARTISTS (Grade 1). Starting £800-£900.

Authors with sufficient experience and skill to plan, write and (drawing on supporting specialists) produce above publications. Technical knowledge and practical engineering experience essential.

Artists able to prepare from orthographic drawings fully sectioned perspectives of complete engines, locomotives, test houses, marine craft, etc. Should have knowledge of different media and reproduction process. Air-brush ability an asset.

LAYOUT ARTIST/TYPOGRAPHER. Starting £700-£800.

Creative ability to design and produce mock-ups for brochures, leaflets, etc., and translate into practical printing. Accurate casting-off expected.

TECHNICAL AUTHORS and ARTISTS (Grade 2). Starting £13-£15 per week.

Technical knowledge and practical engineering experience and two or more years writing and preparing material for publications.

Four or more years experience drawing diagrams, mechanisms, and sections in perspective, to reproduction standard from blueprints. Wash or air-brush an asset.

TRAINEE AUTHORS. Starting £13-£15 per week.

Ex R.A.F. or R.N., or Civil apprentices with field service, instructional, overhaul or inspection experience, who can write simple precise English, are offered tuition in authorship.

AUTHOR/JOURNALIST. Starting at £12-£14 per week.

Young man with knowledge of engineering activities and ability to write interesting articles for press or house magazine use.

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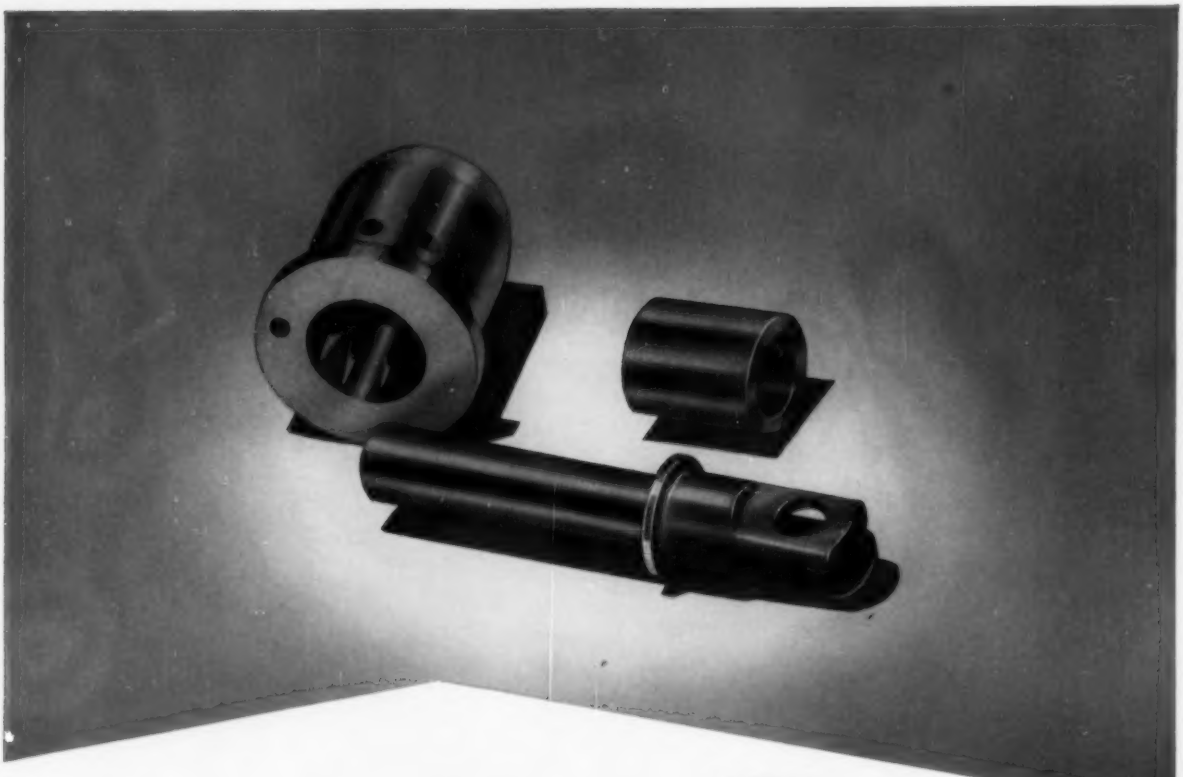

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